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MILITARY

PROSPECTIVE SHIPBUILDING PLANS FOR FY 1983-1987 MTDP

Tokyo JPE AVIATION REPORT-WEEKLY in English No 525, 10 Jun 81 pp 6-8

[Text]

The Maritime Self-Defense Force (MSDF) may limit introduction of new-type ships under the FY 1983-87 Medium-Term Defense Program (MTDP), to be prepared by the end of FY 1981, to the DE escort destroyer, the DLH helicopter-carrying destroyer, some auxiliary ships and the MSC coastal minesweeper, according to observers.

A new DE destroyer will be larger than 1,200-to-1,400-ton types funded by FY 1981. Whether to introduce the larger DE may depend on evaluation of these already-funded ships.

As to the DLH, a new type will carry more antisubmarine helicopters than existing types. Its tonnage is expected to be 8,000 to 10,000 tons. The new one may be subject to basic research in the first half of the new MTDP prior to construction under the FY 1986-90 MTDP.

Other types of destroyers introduced in the past several years, including the 2,900-ton DD, 1,200-to-1,400-ton DE and 4,500-ton DDG, may be subject to evaluation under the MTDP, though partial improvement is likely.

Likely details of MSDF shipbuilding plans under the FY 1983-87 MTDP, as speculated by observers, are as follows:

Destroyers

DDG Guided-Missile Destroyers - The MSDF intends to procure a total of eight DDG destroyers. As five are expected to be funded by FY 1982, the remaining three may be included in the new MTDP. If the existing Amatsukaze retires by the end of the new MTDP, however, a replacement could be added.

DD Destroyers - Seven 2,900-ton DDs may be incorporated into the MTDP as funding until FY 1982 is expected to cover 13 out of 20 vessels necessary to maintain four escort flotillas. If four existing DDA antiair destroyers are deployed for escort flotillas after undergoing the fleet rehabilitation and modernization program (FRAM), the procurement pace for 2,900-ton DDs could be slowed down. There is also the possibility that procurement of the 20 DDs would be facilitated with post-FRAM DDAs used for other missions.

DE Escort Destroyers - Three 1,200-to-1,400-ton DEs have been funded so far, and another's funding is expected in FY 1982. In case the MSDF sticks to an original plan to procure 26 DEs for 10 squadrons, 22 vessels would have to be covered by the MTDP. But problems regarding crew comfortability and equipment exist with DEs of even the 1,400-ton class. The MSDF hopes for a new larger type. Therefore, the figure of 22 for the 1,200-to-1,400-ton class could be reviewed.

Submarines

Seven 2,200-ton SSS submarines are expected to be funded in the new MTDP period to maintain the 16-ship submarine fleet. Although one vessel per year has been funded under the FY 1980-84 MTDP, there may be some two-vessel years under the FY 1983-87 MTDP. Thus, the submarine procurement pace could be higher under the new MTDP.

Minesweepers

Procurement of 440-ton MSC coastal minesweepers may continue for the immediate future, though a shift to an FRP (Forced resin plastic) type is expected around FY 1984. Two to three MSCs per year will be requested in the coming years to complete a 32-ship setup. Funding in the new MTDP period would have to involve 16 vessels. Adoption of the FRP-type MSC may depend on evaluation of new minesweeping equipment and on division of minesweeping missions. Thus, the MSC procurement schedule remains uncertain.

Patrol Boats

A new PM-X patrol boat is now under consideration. The PM-X, replacing the PT torpedo and PB patrol boats, is designed to undertake antiship attack and regional defense missions as well as coastal patrol. Three to four PM-X squadrons are planned for the immediate future. If one

PM-X is funded in FY 1982 for evaluation, eight to 11 vessels would be earmarked for funding in the FY 1983-87 period. The specific PM-X procurement schedule will depend on the details of the final decision to be made on its type and exact operational requirements.

Auxiliary Ships

If funding until FY 1982 is implemented as originally planned, the FY 1983-87 MTDP may envisage procurement of 10 ships, including one AGS surveying ship, one LSU utility landing ship and one AOE fast-combat-support ship, which will be the remainder of auxiliary ships stipulated in the FY 1980-84 MTDP.

CSO: 4120

MILITARY

GSDF TO MODERNIZE ROCKET LAUNCHER

Tokyo JPE AVIATION REPORT-WEEKLY in English No 526, 17 Jun 81 pp 8,9

[Text]

The GSDF is expected to introduce a replacement for the Model 75 self-propelled multi-barrelled rocket launcher in the latter half of the FY 1983-87 MTDP now under preparation.

The replacement is part of the GSDF's artillery modernization program, following introduction of the 203mm self-propelled howitzer and the 155mm towed howitzer and development of the modified Model 75 155mm HSP under the FY 1980-84 MTDP.

The new rocket launcher is planned to have a longer range than the Model 75. It is difficult for the 15-kilometer-range Model 75 to operate jointly with the new howitzers which can shoot targets up to 30 kilometers away.

The GSDF is now considering whether to introduce a foreign system as the new rocket launcher or develop it domestically. License production of a foreign system is seen as promising because the GSDF has no facilities large enough to test the new rocket launcher with such a long range. But some quarters recommend domestic development with a view to Japan's technological improvement after development of the Model 75.

The Model 75 rocket launcher entered service in FY 1976. The FY 1980-84 MTDP envisages procurement of 40 units to increase the total inventory at the end of the current MTDP to 66 units. Model 75 procurement is expected to continue under the new FY 1983-87 MTDP as well.

CSO: 4120

MILITARY

ASDF EXPECTED TO PROCURE ADDITIONAL F-15'S FROM FY 1984

Tokyo JPE AVIATION REPORT-WEEKLY in English No 526, 17 Jun 81 p 5

[Text]

The Air Self-Defense Force (ASDF) intends to start procurement of 70 to 80 additional F-15J fighters in FY 1984 after completing orders for authorized 100 aircraft in FY 1982, according to observers.

The additional F-15J procurement is expected to be incorporated into the FY 1983-87 MTDP now under preparation in order to achieve the ASDF's 350 fighter inventory target stipulated in the Defense Program Outline.

If 80 additional F-15Js are authorized, the ASDF is expected to order 45 aircraft in FY 1984, 25 in FY 1986 and 10 in FY 1987. But if the additional procurement is fixed at 70 aircraft, the 10 aircraft for FY 1987 would be eliminated.

Of the 100 F-15Js authorized by the National Defense Council, the ASDF has ordered 57 aircraft (23 in FY 1978 and 34 in FY 1980). Although it had planned to procure 32 in FY 1982 and 11 in FY 1984 successively, it now intends to order all of the remaining 43 aircraft in FY 1982 to complete acquisition of the 100 F-15Js in FY 1986, one year ahead of schedule, with the additional procurement in mind.

Whether the additional procurement is set at 70 aircraft or 80 aircraft, F-15DJ trainers will account for about seven aircraft of the add-on order. The initially authorized 100 aircraft include 12 DJs.

CSO: 4120

MILITARY

MSDF TO REQUEST SH-X GREEN AIRCRAFT IN FY 1982

Tokyo JPE AVIATION REPORT-WEEKLY in English No 526, 17 Jun 81 pp 7,8

[Text]

The Maritime Self-Defense Force (MSDF) has decided to request two green SH-X new antisubmarine warfare (ASW) helicopters for FY 1982 (April 1982-March 1983) while giving up purchase of high-speed training support aircraft, according to informed sources.

The SH-X is to replace the HSS-2B in the 1990s. The FY 1980-84 Medium-Term Defense Program (MTDP) calls for procurement of two green aircraft which will be modified and equipped with the HSS-2B's ASW components to determine the best SH-X configuration meeting the MSDF's unique requirements. The airframe of the U.S. Navy/Sikorsky LAMPS/MK-III (SH-60B) will be adopted as the SH-X green aircraft soon on the basis of an MSDF mission's recent survey in the United States before the FY 1982 budget request in late August.

The high-speed training support aircraft is designed to promote efficient firing training of MSDF fleets together with the UP-2J, a modified version of the P-2J ASW aircraft. Although the current MTDP envisages procurement of three such aircraft, the MSDF has yet to complete its in-house study, which includes selection of a specific aircraft. The MSDF may not be able to afford to request the sample SH-Xs in the next fiscal year, however, because priority will be given to advanced procurement of P-3C ASW aircraft.

CSO: 4120

MILITARY

GROUND FORCES PLAN 17 WEAPON ITEMS FOR FY 1982 BUDGET

Tokyo JPE AVIATION REPORT-WEEKLY in English No 526, 17 Jun 81 p 7

[Text]

The Ground Self-Defense Force (GSDF) apparently plans 17 items of weapon systems for its FY 1982 budget request in late August, informed sources say, including such new items as the AH-1S antitank helicopter and the command/communications armored personnel carrier.

Item-wise procurement amounts are now under consideration. Observers' attention is paid especially to how an AH-1S procurement scale would affect other items.

As to other main items, the GSDF is expected to request 86 Model 74 tanks, 220 84mm recoilless guns, nine Model 79 Ju-MAT antitank missile systems, 18 203mm self-propelled howitzers (HSP), 34 Model 75 155mm HSPs, eight Model 75 130mm self-propelled multi-barrelled rocket launchers and 17 command/communications APCs for training.

Whether to request the 66mm grenade launcher system in the next fiscal year is still uncertain because evaluation of the system is still under way.

CSO: 4120

MILITARY

GSDF PREPARING FOR 203MM HSP PROCUREMENT

Tokyo JPE AVIATION REPORT-WEEKLY in English No 526, 17 Jun 81 p 8

[Text]

The GSDF is promoting preparations for procurement of the U.S. Army M110A 203mm self-propelled howitzer which has been funded for the first time under the FY 1981 budget.

Its negotiations with the United States on license production of the gun-barrel support and chassis have reached the final stage. Memorandums of understanding to this effect are expected to be exchanged soon between them. The gun barrel will be imported from the United States through the Foreign Military Sales (FMS) channel and the engine through commercial channels.

The GSDF is also proceeding with selection of a prime contractor for the license production. It expects that Japan Steel Works Ltd. will manufacture the gun-barrel support while MHI, Komatsu Ltd. and Hitachi Ltd. will fabricate the chassis jointly. Of these companies, MHI or Hitachi may be named as the prime contractor undertaking assembly of the whole system.

The 203mm HSPs are planned to replace 203mm howitzers and 155mm cannons of GSDF district army artillery units. The FY 1981 budget funds six units for training, out of 43 units envisaged in the FY 1980-84 MTDP. The GSDF expects to procure 12 units per year under the FY 1983-87 MTDP to be prepared by the end of FY 1981.

CSO: 4120

SCIENCE AND TECHNOLOGY

JAPAN'S OVERSEAS PETROCHEMICAL PROJECTS

Tokyo JAPAN PETROLEUM & ENERGY WEEK WEEKLY in English Vol 16, No 20, 18 May 81
pp 1-9

[Text]

Saudi Arabia

Saudi Petrochemicals Development Co., Ltd. (SPDC) and five other firms jointly established on May 7 an investment company called "SPDC Ltd." to promote a Japan-Saudi joint project for the construction of a giant \$1.5-billion petrochemical complex to start operation in 1985 in Al Jubayl in eastern Saudi Arabia. (As a result, the original SPDC became defunct.)

The old SPDC was established on January 22, 1979, jointly by Mitsubishi Corp. and 53 other Japanese industrial firms and banks to undertake a feasibility study of the petrochemical venture. A preliminary agreement had been signed on April 22, 1980, between SPDC and Saudi Basic Industries Corp. (SABIC) for jointly conducting a feasibility study, which was completed in March of this year.

Based on this feasibility study, SABIC and the newly established SPDC Ltd. are scheduled to sign a formal joint venture agreement in Riyadh on May 20.

The Japanese government also decided to invest in the project as part of its economic cooperation with Saudi Arabia in the form of the governmental Overseas Economic Cooperation Fund's capital investment in SPDC Ltd. to acquire a 50 percent equity share of the latter, and International Trade and Industry Minister Rokusuke Tanaka will visit Saudi Arabia in June to sign an agreement on the establishment of a Japan-Saudi joint company on a 50:50 basis to be in charge of the construction and operation of the petrochemical complex.

Under present plans, the petrochemical complex will be designed to produce the following major products, with ethylene and ethylene oxide/ethylene glycol production facilities to be shared with the Dow Chemical/SABIC group (see JPEW Vol.15, No.48, dd. December 1, 1980 - p.16) and polyethylene production facilities to be entirely owned by the SPDC/SABIC group, as shown below:

	(Unit:1,000 metric tons/year)		
	<u>SPDC/SABIC</u>	<u>DOW/SABIC</u>	<u>Total</u>
. Ethylene	230	270	500
. Ethylene oxide/ glycol	150	150	300
. Low-density poly- ethylene	130	-	130

Total capital investments by the SPDC Ltd./SABIC group are estimated at ¥326 billion (\$1.481 billion), which will be financed in the following manner:

	<u>%</u>
. Equity capital of Japan-Saudi joint company:	
SPDC Ltd.	15
SABIC	15
. Saudi governmental Public Investment Fund's loans	60
. Japanese/European banks' loans	10
	<u>100</u>

The capital stock of SPDC Ltd. will eventually be increased to ¥48,500 million (\$220 million), including the capital stock (¥500 million) of the now defunct SPDC. It is expected that the Overseas Economic Cooperation Fund (OECF) will eventually invest ¥24,000 million (\$109 million), i.e. $1/2 \times (\text{¥48,500 million} - \text{¥500 million})$.

In return for Japanese cooperation in the project, Saudi Arabia will supply "bonus" crude to Japan starting January 1982, with the volume initially rated at 20,000 b/d and gradually increased to 110,000-130,000 b/d.

In the wake of the numerous difficulties which arose through Japan's involvement in a \$3.3-billion Japan-Iran joint petrochemical project (see page 8 of this issue for further details), basic agreements have been reached between Japan and Saudi Arabia to include a number of important stipulations protecting Japanese interests.

Among the stipulations to be included in the formal Japan-Saudi agreement is a so-called "retreat clause" whereby in the event that war, natural calamity or any other unforeseeable circumstance preclude continuation of the project, the Japanese side would have the option of entering into mutual discussions on disengaging itself from further investment in the project. If agreement could not be reached on Japan's withdrawal, however, then following a preset period of nine months the Japanese side could withdraw of its own accord.

A second clause designed to protect Japanese interests stipulates that in the event that additional investments are required over the originally estimated cost (approximately \$1,481 million), such investments would be limited to no more than 20 percent of the original figure, with Japan being responsible for no more than 15 percent of this additional sum. This percentage matches the Japanese equity share in the basic project cost, as shown above.

Thirdly, at present the Saudi Public Investment Funds is to provide 60 percent of the total investment moneys on low-interest terms; under the formal joint venture agreement the Japanese side is not to stand as guarantor for these loans. Japan will be responsible only for one half of the loans to be made from Japanese/European sources - or 5 percent of the total amount of funds required for the project.

Listed below are the 60 shareholders of SPDC Ltd., including OECF:

Government - Overseas Economic Cooperation Fund
Coordinating company - Mitsubishi Corp.

Petrochemical companies:

Mitsubishi Petrochemical Co., Ltd.
Mitsubishi Chemical Industries, Ltd.
Mitsubishi Gas Chemical Co., Ltd.
Asahi-Dow Limited
Idemitsu Petrochemical Co., Ltd.
San'yo Petrochemical Co., Ltd.
Shin Daikyowa Petrochemical Co., Ltd.
Sumitomo Chemical Co., Ltd.
Toyo Soda Manufacturing Co., Ltd.
Japan Synthetic Rubber Co., Ltd.
Nippon Shokubai Kagaku Kogyo Co., Ltd.
Nippon Zeon Co., Ltd.
Maruzen Petrochemical Co., Ltd.
Mitsui Petrochemical Industries, Ltd.
Tonen Sekiyu Kagaku K.K.*
Nippon Petrochemicals Co., Ltd.*

Oil companies:

Nippon Oil Co., Ltd.*
Asia Oil Co., Ltd.*
Chita Oil Co., Ltd.*
Mitsubishi Oil Co., Ltd.
Toa Nenryo Kogyo K.K.
Idemitsu Kosan Co., Ltd.
Kashima Oil Co., Ltd.

(*) Newly joined SPDC Ltd. when it was established on May 7, 1981.

Kyushu Oil Co., Ltd.
Kyodo Oil Co., Ltd.
Showa Oil Co., Ltd.
General Sekiyu K.K.
Daikyo Oil Co., Ltd.
Taiyo Oil Co., Ltd.
Toa Oil Co., Ltd.
Nippon Mining Co., Ltd.
Fuji Oil Co., Ltd.
Maruzen Oil Co., Ltd.

Electric power companies:

Tokyo Electric Power Co., Inc.
Kansai Electric Power Co., Inc.
Chubu Electric Power Co., Inc.
Kyushu Electric Power Co., Inc.
Tohoku Electric Power Co., Inc.
Chugoku Electric Power Co., Inc.
Shikoku Electric Power Co., Inc.
Hokkaido Electric Power Co., Inc.
Hokuriku Electric Power Co., Inc.

City gas companies:

Tokyo Gas Co., Ltd.
Osaka Gas Co., Ltd.

Banks:

Mitsubishi Bank, Ltd.
Mitsubishi Trust & Banking Corp.
Bank of Tokyo, Ltd.
Industrial Bank of Japan, Ltd.
The Nippon Credit Bank, Ltd.
Long-Term Credit Bank of Japan, Ltd.

Others:

Mitsubishi Heavy Industries, Ltd.
Asahi Glass Co., Ltd.
Tokyo Marine & Fire Insurance Co., Ltd.
Nippon Yusen K.K.
Mitsubishi Kakoki Kaisha, Ltd.
Mitsubishi Mining & Cement Co., Ltd.
Mitsubishi Warehouse & Transportation Co., Ltd.
Mitsubishi Electric Corp.

Singapore

A ground-breaking ceremony was held on July 17, 1980, on the islet of Pulau Ayer Merbau in Singapore Harbor for the construction of a US\$1.4-billion petrochemical complex, a Japan-Singapore joint venture on a 50:50 basis, for the initial phase operation in 1982. A formal joint venture agreement had been signed by the two parties on August 10, 1977.

For the construction and operation of a 300,000 ton-a-year ethylene plant, a Japan-Singapore joint company, Petrochemical Corporation of Singapore (Private) Ltd. (PCS) was established in Singapore on August 10, 1977, on a 50:50 basis. Prior to this, a Tokyo-based Japanese investment company, Japan-Singapore Petrochemicals Co., Ltd. (JSPC), had been formed on July 1, 1977, with Sumitomo Chemical Co., Ltd. as a coordinator company. JSPC is currently capitalized at ¥3,500 million (which will eventually be increased to ¥10,000 million) and is participated in by the governmental OECF (having a 30 percent equity share) and 31 industrial firms, trading houses and banks (70 percent share). PCS is currently capitalized at 67 million Singapore dollars and is equally shared by the Government of Singapore/The Development Bank of Singapore* and JSPC.

The ethylene production plant is estimated to cost about ¥100 billion (US\$455 million), which will be financed as follows:

(Unit: ¥ billion)

	<u>JSPC</u>	<u>Singapore</u>	<u>Total (PCS)</u>
Equity capital of PCS	10	10	20
Loans to PCS	20	20	40
Japanese banks'	40	-	40
Suppliers' credits	<u>70</u>	<u>30</u>	<u>100</u>

Listed below are the 32 shareholders of JSPC, including OECF:

Government - Overseas Economic Cooperation Fund
Coordinating company - Sumitomo Chemical Co., Ltd.

Petrochemical companies:

Mitsubishi Petrochemical Co., Ltd.
Mitsubishi Chemical Industries, Ltd.
Mitsui Petrochemical Industries, Ltd.
Nippon Petrochemicals Co., Ltd.
Tonen Sekiyu Kagaku K.K.

(*1) Jointly owned by Temasek Holdings Pte. Ltd. (having a 48.7% equity share), wholly owned by the Government of Singapore, Hongkong & Shanghai Bank (Singapore) Nominees Pte. Ltd. (4.8%), Post Office Savings Bank of Singapore (4.1%), Raffles Nominees (Private) Ltd. (1.9%), J. M. Sasson & Co. Nominees Pte. Ltd. (1.8%), etc.

Maruzen Petrochemical Co., Ltd.
Idemitsu Petrochemical Co., Ltd.
Showa Denko K.K.
Asahi Chemical Industry Co., Ltd.
Asahi-Dow Limited
Shin Daikyo Petrochemical Co., Ltd.

Chemical engineering & construction companies:

Kajima Corp.
JGC Corp.
Chiyoda Chemical Engineering & Construction Co., Ltd.
Sumitomo Construction Co., Ltd.
Ishikawajima-Harima Heavy Industries, Ltd.
Hitachi Shipbuilding & Engineering Co., Ltd.
Mitsui Engineering & Shipbuilding Co., Ltd.
Penta Ocean Co., Ltd.

Trading companies:

Sumitomo Corp. Mitsubishi Corp.
Mitsui & Co., Ltd.
C. Itoh & Co., Ltd.
Marubeni Corp.

Banks:

Bank of Tokyo, Ltd.
Industrial Bank of Japan, Ltd.
Long-Term Credit Bank, Ltd.
The Nippon Credit Bank, Ltd.

Others:

Hitachi, Ltd.
Kobe Steel, Ltd.

For the construction and operation of a 120,000 ton-a-year low-density polyethylene plant and a 100,000 ton-a-year polypropylene plant, a Japan-Singapore joint company, Polyolefin Company (Singapore) Pte. Ltd. (TPC), was established in Singapore on May 23, 1980, on a 70:30 basis in favor of Japan. TPC is currently capitalized at 15 million Singapore dollars.

Prior to this, a Tokyo-based Japanese investment firm, Nippon-Singapore Polyolefin Co., Ltd. (NSPC), had been established on March 26, 1980. NSPC is currently capitalized at ¥1,120 million (US\$5 million), which is shared by Sumitomo Chemical (having a 78.6 percent equity share), Ube Industries (7.1 percent), Showa Denko (7.1 percent), Toyo Soda Manufacturing (4.3 percent) and Idemitsu Petrochemical (2.9 percent).

For the construction and operation of an 80,000 ton-a-year medium- and high-density polyethylene plant, Phillips Petroleum Singapore Chemicals (Private) Ltd. (PPSC), was established in Singapore on April 24, 1980, by Phillips Petroleum International Corp. (having a 60 percent equity share), the Government of Singapore/The Development Bank of Singapore (30 percent) and Sumitomo Chemical (10 percent). PPSC is currently capitalized at 14.1 million Singapore dollars.

For the construction and operation of an 80,000 tons-a-year ethylene oxide plant and a 100,000 ton-a-year ethylene glycol plant, a Singapore-based Japan-Singapore-Shell joint company is expected to be established shortly, while a Tokyo-based Japanese investment company, Japan-Singapore Ethylene Glycol Co., Ltd. (JSEC), was established on May 7, 1980. JSEC is currently capitalized at ¥100 million and jointly owned by Mitsubishi Petrochemical (having a 28 percent equity share), Nippon Shokubai Kagaku Kogyo (26 percent), Mitsui Petrochemical Industries (26 percent) and Nisso Yuka Kogyo (20 percent). The Singapore-based company referred to above will be jointly owned by JSEC (having a 50 percent equity share), the Government of Singapore (28 percent), the Royal Dutch/Shell Group (20 percent) and Sumitomo Chemical (2 percent).

For the construction and operation of a 5,200 ton-a-year acetylene black company, Denka Singapore Private Ltd. was established in Singapore on September 20, 1980, with Denki Kagaku Kogyo and Temasek Holdings (Private) Ltd. holding 80 and 20 percent equity shares, respectively.

Estimated total costs for the foregoing polyethylene/ethylene oxide & glycol/acetylene black production facilities will amount to about ¥200 billion (US\$910 million).

Summarized below are the production plans for the Singapore petrochemical complex:

(Unit: tons/year)	Ethylene Plant (PCS)	Derivatives Plants
Feedstock (70% naphtha & 30% LPG)	Ethylene (300,000)	<u>TPC</u>
		Low-density polyethylene (120,000)
		<u>PPSC</u>
		Medium- & high-density polyethylene (80,000)
		<u>To be established</u>
	Propylene (160,000)	Ethylene oxide (80,000)
		Ethylene glycol (100,000)
		<u>To be established</u>
	Acetylene	Octanol (60,000)
		<u>Denka Singapore</u>
	C ₄ - Butadiene (45,000)	Acetylene black (5,200)
	Cracked gasoline	

Benzene (59,000)
Toluene (38,500)
Xylene (29,000)

Iran

As previously reported (JPEW Vol.16, No.17, dd. April 27, 1981 - p.12), Iran Chemical Development Co. (ICDC), the Tokyo-based investment firm in the Japan-Iran joint petrochemical project, recently decided at its board of directors' meeting to reject the Iranian demands for additional financial aid, adding that it would withdraw from the project entirely if the Iranians refuse to bear the costs of additional financing.

Japan's first large-scale economic and technical cooperation with Iran, the petrochemical project was started in 1973 at Bandar Khomeini in southern Iran under the name of Iran-Japan Petrochemical Co. (IJPC), a Tehran-based joint company on a 50:50 basis of ICDC and Iran's National Petrochemical Co. (NPC). The original plan envisaged production of 300,000 tons/year of ethylene, 100,000 tons/year of low-density

polyethylene, 60,000 tons/year of medium- and high-density polyethylene, 170,000 tons/year of ethylene glycol, 50,000 tons/year of polypropylene, etc. The project survived the first oil crisis and had been 85 percent complete by March 1979, when the Islamic revolution caused the construction of the complex to be suspended.

In an effort to speed up the completion of the delayed and hence inflation-plagued project as soon as the political unrest subsided, the Japanese government decided on October 12, 1979, to provide governmental funds, with the OECF investing ¥20 billion (\$90 million) in ICDC, thereby upgrading the project from its private status to that of a national project. Unfortunately, however, the OECF's investment was suspended following the outbreak of war between Iran and Iraq in September 1980. Up to that time, the government had already provided ¥5.4 billion (\$25 million).

ICDC's decision to refuse all further aid to the Iranian project as referred to above was in part a response to the growing uncertainty concerning the ultimate profitability of the project, in view of the rapidly increasing costs involved.

In a repeated effort to seek relief measures for the financial crisis now being encountered, Mitsui & Co., a key shareholder of ICDC, decided at its committee meeting on the Iranian issue held on May 14 to ask the Export-Import Bank of Japan, Mitsui Bank and the Industrial Bank of Japan to shelve ICDC's interest payments totaling ¥2.6 billion (\$11.8 million) due May 27 for at least three months.

In announcing his company's latest decision, ICDC president Eimei Yamashita emphasized that ICDC would not "under any circumstances" continue its investments in the project, the cost of which has already ballooned to approximately ¥730 billion (\$3.3 billion) and is now estimated to require yet another ¥300 billion (\$1.4 billion) before completion.

Yamashita added that negotiations would be held as early as possible either in Tehran or in Tokyo to discuss the matter with the Iranians and to seek revision of present contract conditions, which call for a 50:50 sharing of the financial burden of the project by ICDC and NPC. Under the terms to be sought by ICDC, the Iranians would have a majority share and shoulder all future financing.

The prospect of the Iranians accepting the ICDC decision is quite slim and their refusal is expected to cause increased friction between Iran and the Japanese government, which became involved in the controversial project through its decision to support the project as outlined above. Government officials commented on the ICDC decision by stating that they would stand by and watch developments for the time being. However, no change in government stance is anticipated.

In addition to government investments, to date the Export-Import Bank of Japan has extended loans to the project in the amount of ¥88.8 billion (\$404 million) - ¥28.8 billion to the Iranian Government and ¥60 billion to NPC.

ICDC is currently capitalized at ¥37.554 million (\$171 million), including the OECF's investment up to now totaling ¥5,400 million. Shareholders of the ICDC are: OECF (having a 14.4 percent equity share), Mitsui & Co. (51.4 percent), Mitsui Toatsu Chemicals, Inc. (12.8 percent), Toyo Soda Manufacturing Co. (12.8 percent), Mitsui Petrochemical Industries, Ltd. (4.3 percent) and Japan Synthetic Rubber Co. (4.3 percent). At least two members of the Group expressed grave misgivings as to continued participation because of their own financial difficulties.

CSO: 4120/249

PRESENT STATUS OF NATION'S PLANT EXPORTS

Tokyo DIGEST OF JAPANESE INDUSTRY AND TECHNOLOGY in English No 159, 1981 pp 7-12

[Article by Isao Maeda, deputy director, International Trade Division, Machinery and Information Industries Bureau, Ministry of International Trade and Industry]

[Text]

General Trends

It is presently felt that there is little chance that global demand for plants will continue to increase as previously experienced. A great number of problems both in the political and economic situations, including the decrease of credit worthiness, has been arising in the world market. Even Japan's plant exports, which in FY 1979 continued to show a significant growth and reached \$11.8 billion in FY 1980, are estimated to decrease by some 20 per cent compared with the previous year.

But in the future—medium and long term—Japan's plant exports are expected to develop further, through and backed by the strengthening of international competitiveness, the promotion of international cooperation, and the broadening of economic cooperation. Now, plant exports get into the limelight as a means of providing and promoting economic cooperation and technology transfer effectively, not simply as commercial exports.

Japan's share in the world plant exports market, now estimated about 10 per cent next to W. Germany and the U.S., are expected to continue increasing gradually, or at least to keep present levels.

From Late 1950s

The history of Japan's plant exports began in the late 1950s. Since then, Japan's plant exports had continuously showed a significant growth. Plant exports (exports-license basis) in FY 1966 were only \$327 mil-

lion. From FY 1966 to FY 1976, they grew at an average annual growth rate of 38 per cent (from FY 1971 to FY 1976 at an average annual growth rate of 44%). In FY 1976 they reached \$8 billion. In FY 1977 they reached \$8.6 billion. Plant exports have grown up to be ranked fourth in Japan's export after automobiles, steel products and consumer electronics. And plant exports have become to have a substantial influence on domestic industries, employments, industrial structures and trade structures. At the same time, plant exports get into the limelight as a means of providing and promoting economic cooperation and technology transfer effectively not simply as commercial exports.

As can be seen from this impressive record, Japan's share in world plant exports seems clearly rising. By 1977 with an 11 per cent share behind W. Germany (23%) and the U.S. (19%), Japan is estimated to have surpassed Britain, France and Italy.

From 1970 to 1977 an average annual growth rate of plant-related machinery exports by the group of OECD countries was about 20 per cent. During the same period Japan's plant-related machinery exports showed a 29 per cent growth per annum, higher than that of W. Germany, the U.S., Britain, France and Italy. The statistics for plant-related machinery exports showed a 7 per cent share for Japan in 1970, placing Japan in sixth position. But by 1976, this share had risen to 10 per cent and Japan had passed Britain, France and Italy into third position. Then in 1977 the spread between Japan and Britain and France was widened, closing even further the gap between Japan and the two leaders.

The same trend has been seen in every market. While

Japan has kept the first position—a 42 per cent share in 1977—in the Asia plant-related machinery market. Japan has increased its share in other markets. From 1970 to 1977, Japan's share in Middle East increased from 5 per cent to 12 per cent into third position behind W. Germany and the U.S., in Africa from 4 per cent to 7 per cent into sixth position, in Latin America from 5 per cent to 12 per cent into third position, in Oceania from 12 per cent to 17 per cent into third position, and in Communist Bloc from 9 per cent to 12 per cent into second position behind W. Germany.

Behind such a remarkable development, there existed increased international competitiveness both in price and technology of Japan's plant exports. Based on active domestic plant and equipment investments during the "High growth period," Japanese engineering firms and constructors had increased their technological capabilities and accumulated "knowhow" in plant construction and plant-operation. Also they made a great effort to decrease production costs through the modernization of their facilities, the promotion of standardization both in hardware and software, and the strengthening of "Quality Controls," backed by technological innovation. For example, the number of robots installed into production processes in Japan is the largest in the world. Japanese unique establishment—trading companies, called "SOGO SHOSHA"—have also played important roles with their organizing functions, financing functions and world-wide trading and information networks, to develop business all over the world and to increase the international competitiveness of Japan's plant exports.

Table 1. Japan's Plant Exports
— Export-license basis ⁽¹⁾ —

Fiscal year	Number of licenses	Total ⁽²⁾ value (\$ million)	Compared with previous year (%)	Value per license
1970	213	965	135.7	4.5
1971	231	1,304	135.0	5.6
1972	257	1,491	114.4	5.8
1973	350	2,198	147.5	6.3
1974	415	3,858	175.5	9.3
1975	489	5,241	135.8	10.7
1976	680	8,006	152.7	11.8
1977	736	8,607	107.5	11.7
1978	753	8,729	101.4	11.6
1979	743	11,785	135.0	15.9
(1980) ⁽³⁾	627	7,712	72.8	12.3

Note: (1) Complete plants and their major equipment over \$500 thousand per license (or contract), excluding transportation equipment and machinery — ships, automobiles, trains, etc.

A license is needed for export transactions using non-standard payment, such as payment deferred more than 2 years.

(2) Including costs of hardware and software or services, local costs and costs of third countries involved (such as procurement); approximates contract value.

(3) Not whole FY 1980, only April 1980 to January 1981. The Financial Year (FY) starts from April 1 and concludes March 31.

Source: Ministry of International Trade and Industry

Table 2. Japan's Plant Exports by Area
— Export-license basis —

Fiscal year											
Area	'70	'71	'72	'73	'74	'75	'76	'77	'78	'79	('80)(1)
W. America, W. Europe	0.4 (4.1)	0.3 (2.3)	0.6 (4.0)	0.9 (4.1)	4.5 (11.7)	1.4 (2.7)	3.3 (4.1)	4.9 (5.7)	2.2 (2.5)	4.6 (3.9)	6.8 (8.9)
Africa	0.2 (2.1)	1.4 (10.8)	2.2 (14.8)	1.4 (6.3)	3.7 (9.6)	3.2 (6.1)	8.2 (10.2)	19.5 (22.7)	6.4 (7.3)	8.6 (7.1)	8.5 (11.1)
Latin America	1.4 (14.4)	2.4 (18.4)	3.4 (22.8)	4.1 (18.6)	5.3 (13.7)	10.2 (19.4)	11.8 (14.7)	8.3 (9.6)	20.2 (23.2)	5.9 (5.0)	7.7 (10.0)
Middle East	0.5 (5.2)	1.8 (13.9)	0.7 (4.7)	2.0 (9.1)	3.0 (7.8)	11.4 (21.8)	29.1 (36.3)	18.5 (21.5)	14.2 (16.3)	36.2 (31.0)	16.7 (21.6)
Asia	3.2 (33.0)	4.5 (34.6)	4.4 (29.5)	4.7 (21.4)	14.0 (36.2)	14.9 (28.4)	12.6 (15.8)	18.5 (21.5)	24.1 (27.6)	18.8 (16.0)	22.2 (28.8)
Oceania	0.7 (7.2)	0.3 (2.3)	0.1 (0.7)	0.1 (0.5)	0.6 (1.6)	0.3 (0.7)	0.6 (0.8)	1.2 (1.4)	3.3 (3.7)	0.5 (0.4)	2.5 (3.2)
Communist Bloc	3.3 (34.0)	2.3 (17.7)	3.5 (23.5)	8.8 (40.0)	7.5 (19.4)	11.0 (20.9)	14.5 (18.1)	15.1 (17.6)	17.0 (19.4)	43.2 (36.6)	12.6 (16.4)
Total	9.7 (100.0)	13.0 (100.0)	14.9 (100.0)	22.0 (100.0)	38.6 (100.0)	52.4 (100.0)	80.1 (100.0)	86.1 (100.0)	87.3 (100.0)	117.8 (100.0)	77.1 (100.0)

Note: (1) Only April 1980 to January 1981.

(2) Figures in parentheses are composition ratio (%).

Source: Ministry of International Trade and Industry

Around \$10 billion in FY 1980

Japan's plant exports continued to show a significant increase in every year until FY 1976, but this growth has not continued during the more recent years. Plant exports in FY 1977 and FY 1978 totaled only \$8.6 billion and \$8.7 billion respectively, compared with \$8 billion in FY 1976. In FY 1979, along with the effect of a temporary weakening of the yen, a number of contracts with China kept held over from the previous year were settled. This resulted in a total plant export of \$11.8 billion, an increase of 35 per cent over previous year's \$8.7 billion. In FY 1980, however, having been faced with difficulties including the yen appreciation, the Iran-Iraq war, the USSR's invasion into Afghanistan and the revision of development plans in Algeria, Nigeria as well as China, Japan's plant exports now are estimated to be some 20 per cent down over the previous year. They may be around \$10 billion, probably below the 10 billion dollars level.

The average annual growth rate during FY 1976 to FY 1980 may be about 6 per cent. This is extremely low when compared with about 38 per cent during FY 1966 to FY 1976 (about 44% during FY 1971 to FY 1976).

In April 1980, International Trade Division—the division having the responsibility to issue export-licenses for plant exports—of MITI's Machinery and Information Industries Bureau made a survey on the present status of Japan's plant exports business. According to this survey, about 1480 projects or about \$77 billion of potential business were under negotiation by Japanese exporters. And among these projects, about 290 projects or about \$11 billion business were reported to have a high probability of Japanese exporters in FY 1980.

But the present situation is not good in comparison with the above expectations. Japan's plant exports during April 1980 to January 1981 are some \$7.7 billion (export-license basis), 27 per cent down over the same period of FY 1979. Based on this data, now, it is estimated that Japan's plant exports in FY 1980 (from April 1980 to March 1981) may even be less than \$10 billion.

The main reason for these recent decreases in the growth rate is thought to be related to rapid fluctuations in the yen value. The price competitiveness of Japanese plants, like other commodities, declines owing to the appreciation of the yen. In view of the fact that Japan's plant exports have been made chiefly on a deferred yen payment basis, it has become difficult for Japanese exporters to acquire plant-contracts because of rapid fluctuations in the exchange rate, including the anticipated appreciation of the yen.

Another aspect is the problems of marketing. There are revisions to development plans in developing countries due to the political and economic changes, moves

toward import restrictions owing to the accumulation of foreign liabilities and more frequent policies to protect certain domestic industries, etc. There are also growing difficulties in providing export credits because of the decrease of the credit worthiness in developing countries, especially those other than oil-producing countries.

Important Partners

But in spite of the above mentioned international political and economic circumstances, Japanese exporters and businesses have begun to re-consider the meaning of plant exports. The current viewpoint, however, seems to be a little different from our former one. The relationship between countries is geographically, historically, racially, politically, culturally as well as economically very complex and sophisticated. To keep this relationship good is essential, especially for those countries which depend so many and so much resources on abroad, like Japan. And to keep this relationship good, it is very important for Japan to do its best as a partner not simply or merely as a seller or a buyer. The visits recently made by Prime Minister Suzuki, Foreign Minister Ito and Minister of International Trade and Industry Tanaka are reflections of this wide-spread recognition in Japan. The many proposals which they offered, including the preparation for Official Development Assistance and export credits for projects are also a significant reflection of this wide-spread recognition. And now, special bank loan schemes are being considered for smaller businesses and small-scale project in the world.

Until late 1960s, exports to Asia took up about 60 per cent of Japan's total plant exports, but recently this has fallen substantially. A diversification of markets has occurred. In place of exports to Asia, there are exports to Middle East, Africa, Latin America and so on.

In FY 1980, from April 1980 to January 1981, Japan's plant exports to Asia are \$2.2 billion, up 30 per cent, compared with the same period of the previous financial year. During this period, export-licenses were issued for Singapore, (petrochemical plants about \$120 million and turbine generators about \$160 million), for Indonesia, (cement plants about \$160 million and generating facilities about \$200 million), for the Philippines (copper processing plants about \$380 million), etc.

As for Middle East, during this period, export-licenses were issued for Saudi Arabia, (methanol plants about \$180 million), for UAE (fertilizer plants about \$200 million), for Kuwait (tyre producing plants about \$120 million), for Jordan (cement plant about \$120 million) for Algeria (LPG processing plants about \$500 million).

Other license issues include turbine generators (about \$170 million) for Australia.

Table 3. Japan's Plant Exports by Type
- Export-license basis -

Item \ Year	'70	'71	'72	'73	'74	'75	'76	'77	'78	'79	'80 ⁽¹⁾
Electric Machinery	2.1 (21.7)	2.2 (16.9)	2.3 (15.4)	3.3 (15.0)	4.6 (11.9)	10.5 (20.0)	21.4 (26.7)	16.7 (19.4)	23.5 (26.9)	18.6 (15.7)	18.5 (24.0)
Communication Machinery	1.0 (12.4)	1.3 (6.9)	0.7 (11.4)	0.7 (6.4)	1.3 (6.2)	1.8 (5.7)	0.6 (4.7)	2.5 (5.6)	1.5 (7.0)	0.7 (3.6)	0.8 (4.7)
Textile Machinery	1.0 (10.3)	1.3 (10.0)	0.7 (4.7)	0.7 (3.2)	1.3 (3.4)	1.8 (3.4)	0.6 (0.8)	2.5 (2.9)	1.5 (1.7)	0.7 (0.6)	0.8 (1.1)
General Machinery	5.3 (54.6)	8.7 (66.9)	10.3 (69.1)	16.7 (75.9)	30.2 (78.2)	37.0 (70.6)	54.3 (67.8)	62.1 (72.1)	56.2 (64.4)	94.3 (80.1)	54.1 (70.2)
Chemical	3.6 (37.1)	4.9 (37.7)	2.8 (18.8)	6.3 (28.6)	6.4 (16.6)	15.6 (29.8)	30.6 (38.2)	31.5 (36.6)	8.8 (10.1)	29.3 (24.9)	
Iron & Non-ferrous Metals	0.3 (3.1)	1.8 (13.9)	4.9 (32.9)	4.9 (22.3)	8.9 (23.1)	9.2 (17.6)	8.9 (11.1)	5.2 (6.0)	26.0 (29.8)	28.8 (24.4)	
Pulp	0.05 (0.5)	0.05 (0.4)	0.09 (0.6)	0.2 (0.9)	0.04 (0.1)	0.1 (0.2)	3.1 (3.9)	0.05 (0.1)	0.05 (0.1)	3.4 (0.2)	
Cement	0.1 (1.0)	0.3 (2.3)	0.0 (0.0)	1.8 (8.2)	1.1 (2.9)	1.1 (2.1)	1.6 (2.0)	5.5 (6.4)	2.7 (3.1)	7.6 (0.6)	
Others ⁽²⁾	1.2 (12.4)	1.6 (12.3)	2.5 (16.8)	3.5 (15.9)	13.7 (35.5)	11.0 (21.0)	10.2 (12.7)	19.7 (22.9)	18.6 (21.3)	25.3 (21.4)	
Total	9.7 (100.0)	17.0 (100.0)	14.9 (100.0)	22.0 (100.0)	38.6 (100.0)	52.4 (100.0)	80.1 (100.0)	86.1 (100.0)	87.3 (100.0)	117.8 (100.0)	77.1 (100.0)

Note: (1) Only April 1980 to January 1981.
(2) Including desalination plants, steel structures, mining plants, etc.
(3) Figures in parentheses are composition ratio (%).

Table 4. Share of Major Plant Exporting Countries
- Customs clearance basis expressed as percent of world totals -

	(Unit: %)						
	1971	1972	1973	1974	1975	1976	1977
W. Germany	23.1	23.4	25.5	24.7	22.3	22.8	22.8
U.S.A.	20.8	20.2	19.8	20.9	21.6	21.4	18.9
Japan	6.9	7.6	8.0	8.8	8.5	9.6	10.8
U.K.	12.9	11.7	10.1	9.5	10.2	9.4	9.7
France	7.9	7.8	8.1	7.9	9.2	8.8	8.5
Italy	6.5	7.0	6.3	6.1	6.4	6.1	6.8

Note: Share in plant-related machinery export.
Heavy machinery excluding aircraft, trains, ships, automobiles, etc. SITC 711, 712, 715, 717-1, 718, 719 (719-4, 719-7 excluding), 722, 723, 724-9, 691-1
Source: OECD Trade by Commodities, Series C.

Added to these projects, many projects are now under negotiation. Major examples are as follows.

Asia

In Taiwan, hydroelectric plants, petrochemical plants; In Indonesia, oil refineries, fertilizer plants, LNG processing plants, coal and geothermal power plants, cement plants; In Thailand, LPG/LNG processing plants, petrochemical plants, thermal and hydroelectric power plants; In Malaysia, LNG processing plants, fertilizer plants, oil refineries, steel making plants, thermal and hydroelectric power plants; In Singapore, petrochemical plants, thermal power plants; In the Philippines, coal and geothermal power plants, LNG processing plants, cement plants, fertilizer plants, pulp and paper plants.

Middle East

In Saudi Arabia, thermal power plants, desalination plants; In Iraq, fertilizer plants, cement plants, oil refineries; In Qatar, oil refineries; In Kuwait, oil refineries; In UAE, thermal power plants, fertilizer plants; In Jordan, cement plants, thermal power plants.

Africa

In Algeria, LPG/LNG processing plants, thermal power plants, cement plants, steel making plants; In Libya, steel making plants, thermal power plants; In Nigeria, thermal power plants, fertilizer plants, oil refineries, LNG processing plants.

Latin America

In Argentina, hydroelectric plants, steel making plants, telephone switching systems; In Chile, thermal power plants; In Peru, copper processing plants; In Mexico, thermal power plants, steel making plants.

Japan will be sure to contribute these projects by making the most use of its own experience in industrialization, along with its technology, quality and competitive cost of products and services, and reliable delivery performance as well as sales networks. Promoted even by the private sector, plant exports bring about a degree of economic cooperation that can contribute to the industrialization of importing nations and also to progress of their economies.

Based on this recognition, Japan should strengthen cooperation with world nations, as a partner, in a wide range of industrial and economic plans, without adhering to the narrow meaning of project cooperation. ■

Table 5. 10 Largest Importing Countries of Japan Made Plants

Fiscal year Order	1975	1976	1977	1978	1979
1	Iraq	Iran	Algeria	Brasil	China
2	U.S.S.R.	U.S.S.R.	U.S.S.R.	China	Saudi Arabia
3	Philippines	Saudi Arabia	Nigeria	R.O.K.	Iraq
4	R.O.K.	Brasil	Saudi Arabia	Indonesia	U.S.S.R.
5	Singapore	R.O.K.	R.O.K.	Saudi Arabia	Taiwan
6	Algeria	Algeria	G.D.R.	U.S.S.R.	Kuwait
7	Argentina	Iraq	Brasil	Australia	Singapore
8	Indonesia	Kuwait	Iran	Algeria	Algeria
9	Chile	Quatar	U.A.E.	Iran	Indonesia
10	Cuba	U.A.E.	Venezuela	Taiwan	Philippines
Share of 10 largest Importing Countries	65.4%	67.0%	61.6%	64.8%	74.5%

SCIENCE AND TECHNOLOGY

INDUSTRY DELEGATION TO VISIT SOUTHEAST ASIA IN FALL

Tokyo JPE AVIATION REPORT-WEEKLY in English No 525, 10 Jun 81 p 2

[Text]

The Society of Japanese Aerospace Companies (SJAC) plans to send a delegation to Southeast Asian countries this fall in an attempt to expand exports of Japanese aerospace products and technology.

The SJAC delegation is scheduled to visit industrial firms and government agencies in these Southeast Asian nations to help develop the aerospace industry in those countries and to seek ways in which the Japanese aerospace industry can advance into the market in these areas.

Industry sources said that the main items which will be recommended for development in this region will include artificial satellites, rocket systems, and ground-control equipment.

Exports of Japan's space industry presently amount to about ¥20 billion per year, and most of them are for ground facilities.

CS0: 4120

SCIENCE AND TECHNOLOGY

MT-X EJECTION SEAT SYSTEM TO BE SELECTED LATE THIS YEAR

Tokyo JPE AVIATION REPORT-WEEKLY in English No 525, 10 Jun 81 pp 8, 9

[Text]

An ejection seat system for the Air Self-Defense Force's (ASDF) MT-X next-generation intermediate trainer may be selected in November or December after the Defense Agency names a prime contractor for the MT-X program in late September.

So far, four foreign companies have proposed their respective ejection seat systems to MHI, KHI and FHI which are vying for the MT-X contract. The four are McDonnell Douglas Corp. (MDC), Stencel Corp., Weber Aircraft Div. of Walter Kidde & Co., and Martin-Baker Aircraft Co. Their proposals have also been presented to Daisel Ltd. which will undertake fabrication of the ejection seat system in the MT-X program.

Among proposed systems, the MDC ACES-II is used for the F-15 Eagle fighter, the Stencel SJS-3ER for the A-7, TA-7, A-4 and TA-4 attack and training aircraft, and the Weber ES-7J for the ASDF T-2 trainer and F-1 support fighter. Martin-Baker has proposed the MK10.

The three Japanese airframe manufacturers are considering the ACES-II, the SJS-3ER and the ES-7J as candidates in view of their past airframe production experiences, procurement costs, supply of imported parts and other aspects. There is little difference in performance of the proposed systems. MHI plans to adopt the ES-7J now mounted on its T-2 and F-1 with a view to cost reduction, while KHI and FHI intend to use the lightweight and low-priced SJS-3ER or the F-15J's ACES-II. The price of the ACES-II could be

reduced because of domestic license production of ASDF F-15Js.

The prime contractor's views will be respected in selection of the seat-ejection system, which must be hastened in order to start basic design work on the MT-X in the current fiscal year as originally planned. The seat system has a major bearing on the basic design.

The airframe manufacturers expect that they would have to hold costs of the ejection-seat system down to Y25-to-30 million per aircraft in 1980 prices to meet the Defense Agency's strict cost controls regarding the MT-X program.

CSO: 4120

SCIENCE AND TECHNOLOGY

NISSAN MOTOR PROMOTES AEROSPACE BUSINESS

Tokyo JPE AVIATION REPORT-WEEKLY in English No 525, 10 Jun 81 pp 2,3

[Text]

Nissan Motor Co. plans to set up a new organization in its aerospace division by July to explore medium- and long-term demand for defense and space equipment.

Nissan, which has experience in the production of defense and space equipment, designs the in-house organization as a main promoter of joint development and production of such equipment with other companies. It agreed with Hitachi Ltd. late last year to cooperate on the research and development of such equipment. Furthermore, it intends to develop missiles together with Hitachi and Fuji Heavy Industries Ltd.

The company has developed solid-fuel rockets in the past. As to defense equipment, it has produced ammunition for the Model 73 107mm mortars and multi-barreled rocket systems, and others. Its sales of defense and space equipment are projected at ¥12,800 million for FY 1981 (April 1981-March 1982) and ¥15,000 million for FY 1982.

Besides its short-term activities in the space field, Nissan wants to advance its medium- and long-term strategy for defense- and space-related business. The new organization is expected to serve as a strong stimulant for the advancement.

CSO: 4120

SCIENCE AND TECHNOLOGY

ASDF STUDYING DOMESTIC PROJECTION OF NIKE-J SPARE PARTS

Tokyo JPE AVIATION REPORT-WEEKLY in English No 525, 10 Jun 81 pp 5,6

[Text]

The Air Self-Defense Force (ASDF) has decided to let a domestic manufacturer produce spare parts of the ground equipment for the Nike-J surface-to-air missile system to cope with the United States' suspension of spare-parts supply in FY 1985.

The ASDF is required to extend the Nike-J's service life beyond FY 1985 because a delay is certain in the introduction of the SAM-X next-generation antiaircraft missile to replace the Nike-J. Although it had planned to procure the Raytheon Patriot as the SAM-X from FY 1982 or 1983, a survey mission sent to the United States in March 1981 found Japan will not be able to introduce the Patriot until FY 1984 or 1985. The ASDF now intends to maintain the Nike-J while continuing to consider the Patriot and the MHI-proposed Nike Phoenix, another SAM-X candidate.

It has already received proposals for license production of Nike-J ground equipment parts from Nippon Electric Co. (NEC), Hitachi, Ltd., NEC Radio Equipment Engineering and Hitachi Shonan Electronics. Selection of a prime contractor may be made after consideration of the proposals lasting until the end of June. Among the four companies, NEC is certain to be named the prime contractor because it has a technical tie-up with Western Electric, the maker of the Nike-J ground equipment, under which NEC is allowed to produce the spare parts in the future. In that case, NEC Radio Equipment Engineering and Hitachi Shonan Electronics, which undertake overhaul of the Nike-J ground equipment, would actually manufacture the spare parts as NEC's sub-contractors.

CSO: 4120

SCIENCE AND TECHNOLOGY

SECOND PHASE FABRICATION OF SONAR SUPPORTER IN FY 1982

Tokyo JPE AVIATION REPORT-WEEKLY in English No 525, 10 Jun 81 p 9

[Text]

The Technical R&D Institute (TR&DI) expects to fabricate its second preliminary data collection system for shipborne antisubmarine sonars in FY 1982.

The system is aimed at observing water temperatures, sea-bottom conditions and other environmental aspects to provide sonars with data for fixing appropriate frequencies. This is expected to help improve sonars' performance together with modernized sensors, lengthened detection ranges and advanced sonar devices.

The TR&DI fabricated the first-phase preliminary data collection system in FY 1977 for active sonars. The system was tested in FY 1978 and 1979. Following the successful tests, it sought funding of the second-phase system for passive sonars in FY 1981. But the Defense Agency failed to incorporate this funding worth ¥47 million into its budget request for that fiscal year.

The TR&DI will seek the funding again for FY 1982, considering the system as an urgent item for increasing the Maritime Self-Defense Force's antisubmarine capability. If the funding is authorized, it would fabricate the second-phase system for tests in FY 1982 and 1983.

CSO: 4120

SCIENCE AND TECHNOLOGY

ANTI-MORTAR RADAR DEVELOPMENT FROM FY 1982

Tokyo JPE AVIATION REPORT-WEEKLY in English No 525, 10 Jun 81 pp 9,10

[Text]

The GSDF and TR&DI may strongly request funding of their program for development of a new anti-mortar radar in FY 1982 after the request was disapproved both in FY 1980 and 1981, according to informed sources.

They plan the radar to become operational after the middle of the 1980s. They had hardly anticipated the disapproval in FY 1981 because the program was one of priority items designated by the Defense Agency Director-General in the FY 1981 budget request. But they acknowledge the disapproval resulted from coordination with other programs under financial limitations not from denial of the program itself. Therefore, they place great expectations on funding in FY 1982.

The GSDF and TR&DI will design the new anti-mortar radar to have a phased-array antenna for a longer detection range, a modernized data processing system for dealing with multiple mortar shells simultaneously and ECCM (electronic counter countermeasure) devices, according to experts.

They have decided to adopt a towed-type rather than a self-propelled type for the radar, although both types had been studied.

CSO: 4120

SCIENCE AND TECHNOLOGY

FURUKAWA DEVELOPS RELIABLE SATELLITE BATTERY

Tokyo JPE AVIATION REPORT-WEEKLY in English No 525, 10 Jun 81 p 10

[Text]

Furukawa Battery Co. has developed a highly capable and reliable battery for satellites in cooperation with the National Space Development Agency (NASDA).

This battery is highly valued by NASDA, which says it can be used for application satellites satisfactorily. Coupled with Sharp Corp.'s successful development of advanced solar cells, Furukawa's achievement will contribute much to Japan's efforts to establish independent space technology, NASDA says.

The new battery is expected to enable Furukawa to penetrate the world's satellite battery market which is now monopolized by General Electric Corp.

Satellite batteries are required to resist a high degree of vacuum, high-energy radio-active cosmic rays and sharp temperature fluctuations in the space. Furukawa's battery, consisting of nickel-cadmium cells, meets all these requirements. Electrodes are tightly enclosed by a special seal to avoid leaking of liquid and short circuit which have made satellites useless.

The special seal is made of ceramic materials instead of plastics which are used for nickel-cadmium cells on the earth. If plastics are used in the space, the cells' electrolyte could vaporize and go through the plastic seal into the space.

CSO: 4120

SCIENCE AND TECHNOLOGY

MAJOR DEFENSE EQUIPMENT CONTRACTS IN FY 1980

Tokyo JPE AVIATION REPORT-WEEKLY in English No 525, 10 Jun 81 pp 3-5

[Text]

The Japanese Defense Agency's major equipment contracts (worth more than ¥100 million) awarded in FY 1980 (April 1980-March 1981) are as follows:

<u>EQUIPMENT ITEM</u>	<u>NUMBER</u>	<u>VALUE</u> (¥100 million)	<u>CONTRACTOR</u>
(GSDF)			
Model 75 155mm HSP chassis	26	27	MHI
155mm HSP gun, turret	26	42	Japan Steel Works
Model 74 tank chassis	60	161	MHI
105mm tank gun	60	18	Japan Steel Works
Improved Hawk SAM component set (I)	1	234	MELCO
Improved Hawk SAM component set (II)	1	106	Toshiba
OH-6D observation helicopter	10	11	KHI
UH-1H utility helicopter	5	14	FHI
(MSDF)			
DD destroyer body	1	120	IHI
DD destroyer body	1	120	SHI

<u>EQUIPMENT ITEM</u>	<u>NUMBER</u>	<u>VALUE</u> (¥100 million)	<u>CONTRACTOR</u>
DD powerplant	2	84	KHI
DE destroyer body	1	75	Hitachi Ship- building & Engineering
DE powerplant	1	15	KHI
SS submarine body	1	157	MHI
MSC minesweeper body	1	25	Nippon Kokan
MSC minesweeper body	1	25	Hitachi Ship- building & Engineering
P-3C ASW aircraft airframe	10	475	KHI
P-3C engine	40	68	IHI
P-3C propeller	40	21	Sumitomo Precision
US-1A search/rescue flyingboat airframe	1	75	Shin Meiwa
HSS-2B ASW helicopter airframe (ASDF)	2	29	MHI
F-15J fighter airframe	30	1,430	MHI
F-15J engine	60	573	IHI
F-15DJ trainer equipment	1 set	258	U.S. Air Force
F-1 support fighter airframe	3	36	MHI
F-1 engine	6	20	IHI
T-2 advanced trainer airframe	4	43	MHI
T-2 engine	8	27	IHI
KV-107A rescue helicopter	2	19	KHI

SCIENCE AND TECHNOLOGY

ERAAE PROJECTS MADE HEADWAY IN FY 1980

Tokyo JPE AVIATION REPORT-WEEKLY in English No 526, 17 Jun 81 pp 3,4

[Text]

Aeroengine development programs of the Engineering Research Association for Aerojet Engines (ERAAE) made a smooth headway in FY 1980 ending in March 1981, according to its business report.

ERAAE conducted performance, duration and environment tests on the FJR710 experimental fanjet engine in the year as originally planned. Test data were used for improving the FJR710-600 design. High-altitude performance tests at the British National Gas Turbine Establishment (NGTE), planned for January-February 1981, were delayed until April at the request of the NGTE.

The association also determined specifications of the FJR710-600S engine for an experimental low-noise STOL (short takeoff and landing) aircraft now under development by the National Aerospace Laboratory of the Science and Technology Agency. It concluded a contract on the first and second FJR710-600S engines with the agency and started negotiations on the third and fourth engines. The experimental STOL is planned to make the first flight in FY 1983.

As to the joint RJ500 fanjet engine development program with Rolls-Royce, work on basic and detailed designs of a prototype for ground tests started in Bristol, (UK) in the beginning of the fiscal year (April 1980) under a contract signed in December 1979 between Rolls-Royce and three Japanese engine manufacturers -- Mitsubishi Heavy Industries Ltd. (MHI), Kawasaki Heavy Industries Ltd. (KHI) and Ishikawajima-Harima Heavy Industries Co. (IHI). In Japan, ERAAE implemented detailed design work, research on key engine elements and manufacture of tools for the ground test prototype. Loans were given to ERAAE for the RJ500 project by the Ministry of International Trade and Industry.

SCIENCE AND TECHNOLOGY

THREE FIRMS SUBMIT MT-X PROPOSALS

Tokyo JPE AVIATION REPORT-WEEKLY in English No 526, 17 Jun 81 p 5

[Text]

Three airframe manufacturers have recently submitted their proposals to the Japanese Defense Agency's (JDA) Technical R&D Institute (TR&DI) on development of the MT-X next-generation intermediate trainer for the Air Self-Defense Force.

The TR&DI is now evaluating their proposals before selection of a prime contractor from the three -- Fuji Heavy Industries (FHI), Kawasaki (KHI) and Mitsubishi (MHI).

Although the evaluation could be completed by the end of July, final selection of the prime contractor is expected to come in September after the agency's FY 1982 budget request is submitted late in August.

The JDA will consult with the Ministry of International Trade and Industry on the selection, because the MT-X program has a major bearing on the future of Japan's aircraft industry.

The MT-X program is to start in the current fiscal year with basic design work. Detailed design work is planned for the next fiscal year.

CSO: 4120

SCIENCE AND TECHNOLOGY

ASDF TO DECIDE ON F-4EJ IMPROVEMENT BY LATE JUNE

Tokyo JPE AVIATION REPORT-WEEKLY in English No 526, 17 Jun 81 p 6

[Text]

The ASDF is expected to make a decision on the improvement of the F-4EJ fighter interceptor by around the end of June in order to incorporate F-4EJ improvement funds into the FY 1982 budget request in late August.

The service intends to improve the aircraft so that new Sparrow and Sidewinder air-to-air missiles will be mounted to give it look-down capability. Specifically, the F-4EJ will be equipped with new types of radar for its fire-control system (FCS), scope, firing computing system, headup display and inertial navigation system.

In this respect, MHI has proposed four combinations of two headup displays and two FCS radar systems -- the Westinghouse APG-66 for the F-16 and the Hughes APG-65 for the F-18. The ASDF may select one from the four.

The F-4EJ improvement funds for FY 1982 will be used to finance engineering of the system and purchases of sample components.

CSO: 4120

SCIENCE AND TECHNOLOGY

JDA MAY LAUNCH NEW SUPPORT FIGHTER DEVELOPMENT IN FY 1983 OR 1984

Tokyo JPE AVIATION REPORT-WEEKLY in English No 526, 17 Jun 81 pp 9,10

[Text] The Japanese Defense Agency (JDA) is expected to launch development of a new support fighter, dubbed FS-X, in FY 1983 or 1984, as part of the early stage of the FY 1983-87 Medium-Term Defense Program (MTDP), in order to achieve, along with additional procurement of F-15J fighter interceptors, a target fighter inventory for the Air Self-Defense Force (ASDF) of 350 aircraft.

The FS-X is designed as a replacement of the F-1 support fighter. But the new fighter could become an FI-X to replace the F-4EJ fighter interceptor as well as the F-1.

The target fighter inventory, as stipulated in the Defense Program Outline, consists of about 250 fighter interceptors for 10 squadrons and about 100 support fighters for three squadrons. Other ASDF aircraft in the outline are about 80 reconnaissance, transport and early warning planes.

The ASDF has already completed acquisition of 140 F-4EJ fighter interceptors. An F-4EJ inventory at the end of the FY 1980-84 MTDP is estimated at 109 aircraft. Procurement of 77 F-1 support fighters is now under way for completion by the end of the FY 1980-84 MTDP with an inventory at the end of the program planned at 63 aircraft. F-1s are replacing F-86Fs forming three squadrons. Besides F-4EJs and F-1s, the ASDF plans to finish procurement of 100 F-15J/DJ fighter interceptors by the end of the current MTDP to take the place of outdated F-104Js for four fighter interceptor squadrons.

Under the FY 1983-87 MTDP to be prepared by the end of FY 1981, the ASDF expects to increase the number of aircraft per squadron from the current 18 aircraft to 25 aircraft by procuring an additional 80 F-15J/DJs. Even if the additional 80 F-15J/DJs are procured, however, the ASDF's fighter inventory would be 30 aircraft short of the 350 aircraft target. FS-X or FI-X fighters are designed to make up for the shortfall and maintain the 350 aircraft setup by replacing outmoding F-1s and F-4EJs.

SCIENCE AND TECHNOLOGY

LICENSE PRODUCTION OF BENDIX OBOGS PROPOSED FOR ASDF AIRCRAFT

Tokyo AVIATION REPORT-WEEKLY in English No 526, 17 Jun 81 pp 4,5

[Text]

Tokyo Aircraft Instrument Co. and C. Itoh Aviation Co. have proposed license production of the Bendix onboard oxygen generation system (OBOGS) for Air Self-Defense Force (ASDF) aircraft, including the MT-X next-generation intermediate trainer whose development is to start in the current fiscal year.

They have already introduced sample systems for demonstrative explanation to the ASDF, the TR&DI and aircraft manufacturers.

The Bendix system is a sophisticated oxygen generator to take the place of the liquid oxygen system. The U.S. Marine Corps is expected to adopt the system after tests using the Harrier, while the U.S. Air Force is evaluating it on the F-16 fighter.

The system is also considered as replacement of the liquid oxygen bomb for the ASDF F-1 support fighter, T-1/2 trainers and F-4EJ fighter interceptor.

CSO: 4120

SCIENCE AND TECHNOLOGY

GOVERNMENT ROLE IN JAPAN'S TECHNOLOGICAL DEVELOPMENT REVIEWED

Energy Technology

Tokyo KOGYO GIJUTSU in Japanese Vol 22, No 3 Mar 81 pp 27-37

[Text] In the severe international energy situation of the present, Japan urgently needs to establish energy security. In developing an energy strategy, the role of energy technology is as important as securing petroleum resources overseas. The development of energy technology must be actively promoted for the following reasons. 1) It makes it possible to develop unused petroleum resources and use and apply alternative energy sources, thus raising the ceiling on the energy supply. 2) Through expansion of alternative energy sources, it is possible to control the continually growing price of petroleum and stabilize energy prices. 3) By developing technology which makes more effective use possible, conservation of energy can be promoted in the demand structure.

As a large exporter of petroleum and a technologically advanced country, Japan has an international obligation to promote the development of energy technology. However, this development entails the following problems, with some variations depending on the level of advancement of the technology involved. a) Long time periods for research and large amounts of money and labor are required. b) Innovative technology is necessary and risks are great. c) Large amounts of time are necessary for disseminating the results of research. d) There is little time left before practical application must be made possible. In addition, the results of energy technology development do not belong to a particular group or individual but will ultimately be of equal benefit to all the people of the nation. Therefore, the government should provide vigorous support to and promote technological development in all energy fields.

1.1 Petroleum-Related Energy

1) Petroleum Development Technology

1) Development of Unused Hydrocarbon Resources

Coal, Petroleum, and Alternative Energy Source Special Account: 1.246 billion yen (new)

The development of oil shale as a new energy resource has become an urgent issue. Beginning in 1982, technology will be developed under a 5-year plan (total of 14

billion yen) for development systems such as extraction, pulverization, and dry distillation. Oil shale is built up of the remains of seaweed and other organic remains rich in oil together with minerals. It breaks down over a long period of time into an organic substance called kerogen incorporated in solid form in a mineral deposit. In 1981, tests will be made on the basic physical properties of oil shale, and research will be carried out on the basic component technology involved in oil shale development. In addition, equipment for reaction experiments will be built to assess basic characteristics in a pivotal technology, the dry distillation process.

ii) Offshore Petroleum Production System

Coal, Petroleum and Alternative Energy Source Special Account: 3.396 billion yen (3.183 billion yen in 1980)

This research and development is effective in production of petroleum in deep offshore oil fields (more than 300 meters under water). It aims at developing technology for a system applicable to the continental shelf and slope around Japan. It is based on a large-scale industrial technology research and development system and is being carried out under a 7-year plan which started in 1978. In 1981 equipment for comprehensive marine testing will be designed and built and some of the prototypes of the equipment will be tested. Also, a plan for carrying out comprehensive marine testing will be developed.

iii) Promotion of Petroleum Development Technology

Petroleum Development Technology Promotion Expenses Subsidy

Coal, Petroleum and Alternative Energy Source Special Account: 273 million yen (225 million yen in 1980)

Petroleum Development Technology Improvement Measures Survey

Coal, Petroleum and Alternative Energy Source Special Account: 51 million yen (new)

The technology promotion expenses subsidy is used for training of petroleum engineers in the Japan Petroleum Development Corporation as well as development of improved flooding methods and highly accurate seismic prospecting methods at the corporation's Petroleum Development Technology Center.

The technology improvement measures survey is a survey of the strengthening of areas which are particularly lagging in comparison to other countries such as training of petroleum engineers and marine petroleum exploration capability.

2) Technology for Handling Heavy Petroleum

i) Research and Development Expense Subsidy for Heavy Petroleum Technology

Coal, Petroleum and Alternative Energy Source Special Account: 5.704 billion yen (6.8 billion yen in 1980)

In order to deal with the increased import of heavy petroleum and the demand for lighter petroleum in petroleum products, technology is being developed to handle

heavy petroleum, especially heavy petroleum cracking technology, under a 4-year plan (total operating expenses: 25 billion yen). The following items will be tackled in 1981:

- a) heavy petroleum cracking technology: development of high-efficiency catalyst for bench plant cracking and operating studies of pilot plants;
- b) technology for applying low-quality residual oil to steel production: design and partial construction of pilot plants;
- c) production of artificial coking coal: construction of pilot plants.

ii) Technology Development Subsidy for Effective Utilization of Heavy Petroleum Residue

Coal, Petroleum and Alternative Energy Source Special Account: 1,135 billion yen (new)

Development of technology for effective utilization of residue was begun in 1981 under a 4-year plan (total operating expenses: 13.5 billion yen). The purpose is to obtain city gas and produce hydrogen inexpensively from pitch, petroleum coke, and other heavy oil residues. In 1981 pilot plants will be designed and partially constructed for city gas production and some pilot plants will be designed and built for low cost hydrogen production.

3) Research and Development for New Fuel Technology

Coal, Petroleum and Alternative Energy Source Special Account: 3,566 billion yen (1,220 billion yen in 1980)

Development of the following three types of new fuel technologies was started in 1980 under a 7-year plan (total operating expenses: 37 billion yen).

- Production technology for synthetic alcohol and synthetic hydrocarbons based on natural gas.
- Technology for refining and reforming oil sand and oil shale.
- Biomass utilization technology.

The following work will be done in 1981:

- a) production of synthetic alcohol and hydrocarbons: catalyst development and design of large-scale pilot plants;
- b) oil sand and oil shale petroleum: bench plant tests and design of large-scale pilot plants;
- c) biomass resources: search for optimum fermentation bacillus for cellulose decomposition and fermentation, search for optimum fermentation agent, and the construction and operation of a pilot plant for a solid fermentation agent.

4) Other Items

In addition, surveys will be made of petroleum and LPG facilities and technology, and research and development will be undertaken for a long-distance undersea pipeline.

1.2 Nuclear Energy

(i) Technology for Maintaining Safety and Improving the Reliability of Nuclear Power Plants

i) Consignment Expenses for Assessment of Light-Water Reactor Technology Improvement

Special Electrical Power Diversification Account: 738 million yen (new)

Overcoming the problems of exposure and load follow-up is important in promoting the development and use of nuclear-generated electrical power. Recirculation pumping equipment built into nuclear reactors and high-grade fuel which is necessary for load follow-up operations make a great contribution to reducing exposure. In order to promote practical application of this technology, assessment of safety and reliability will be initiated in 1981 under 7-year plan (total operation expenses: 20 billion yen).

In 1981 testing equipment for pumps will be designed and some of it will be built. Simulated fuel aggregate properties tests and practical radiation and post-radiation tests in an actual reactor will be prepared for high-grade fuel.

ii) Grant for Assessment of Auto-Testing Equipment in Practical Power Plant Nuclear Reactors

Special Electrical Power Diversification Account: 338 million yen (new)

Automation and mechanization of all operations performed in a radioactive environment is essential for reducing exposure to radiation in connection with testing and other operations in nuclear power plants. Therefore, 2.7 billion yen in assistance will be provided for assessment of such equipment by the private sector for a 5-year period beginning in 1981.

iii) Reliability Assessment of Nuclear Power-Generation Facilities

Consignment Expenses for Reliability Assessment

Special Electrical Power Site Procurement Account: 10.659 billion yen
(7.696 billion yen in 1980)

portion assigned to MITI 6.173 billion yen (3.573)

Earthquake-Proof Reliability Assessment Subsidy

Special Electrical Power Site Procurement Account: 1,742 billion yen
(3.795 billion yen in 1980)

These tests are made to confirm the safety and reliability of major nuclear power generation facilities during earthquakes and to test reliability of pumps and parts affected by heat, such as valves, under severe operating conditions. This is done to maintain safety in these facilities and to dispel the doubts of the local inhabitants.

In 1981, a large high-performance vibrating platform will be built to test reliability in resistance to earthquakes. In preparation for next year's tests, a testing apparatus (housing for the pressurized water reactor) will be built. Also, testing equipment will be designed and built and tests will be made to confirm the reliability of valves and other parts and fittings, depending on the level of progress.

iv) Safety Analysis Code

Consignment Expenses for Improving the Safety Analysis Code for Practical Power-Generation Nuclear Reactors

Special Electric Power Diversification Account: 1.331 billion yen
(1.077 billion yen in 1980)

Consignment Expenses for Testing of Earthquake-Resistance Safety Analysis Code

Special Electric Power Diversification Account: 530 million yen
(452 million yen in 1980)

A safety inspection code is under development for cross-checking the safety analysis results produced by applicants for permission to install nuclear power plants. This was started in 1980 with a 7-year plan (total operating expenses: 12 billion yen).

In 1981 the main activity will be a program modification test run for putting codes developed and reported in other countries into Japanese computers.

The earthquake-resistance analysis code development began in 1955 under a 6-year plan (total operating expenses: 8 billion yen) and is still under development. In 1981 a model test unit for nuclear reactor facilities will be produced and vibration tests will be conducted.

v) Consignment Expenses for Assessment of Decommissioned Power-Generation Nuclear Reactors

Special Electrical Power Diversification Account: 40 million yen (new)

To prepare for the decommissioning of reactors which will take place in the near future, assessment will be made on technology for decommissioning nuclear reactors from the point of view of safety and reliability, especially remote cutting and concrete surface stripping technology. This will begin in 1981 under a 7-year plan (total expenses: 1.1 billion yen).

In 1981, preparatory and detailed plans will be made for remote cutting, and design and partial production will be carried out for equipment related to surface stripping.

vi) Nuclear Power Plant Support Systems Development Subsidy

Special Electrical Power Diversification Account: 1.104 billion yen
(850 million yen in 1980)

Large-scale, highly effective nuclear power plant support systems, which accurately detect irregular conditions and their causes in nuclear power plants and give proper instructions to the operators, are under development in a 5-year plan (total expenses: 8 billion yen) which began in 1980.

These support systems are of two types.

a) Instruction system: This system comprehensively assesses data on the operation and condition of the parts comprising the nuclear power plant, gives operators information on the soundness of plant operation, and gives appropriate instructions.

b) Auto-inspection system inside housing: With this system, detection instruments inside the housing where radiation is heavy are operated by remote control to detect the condition of the equipment inside.

In 1981 these systems will be designed in detail and partially constructed.

(2) Promotion of Development and Application of Advanced Reactors

i) Consignment Expenses for Advanced Power-Generation Reactor Application Systems Development

Special Electrical Power Diversification Account: 27 million yen (new)

In order to meet future restraints on uranium resources, it is important to develop and use fast breeder reactors which produce more fuel than they consume and, as a supplementary reactor, the heavy water reactor. Therefore, a survey will be made of the technical and economic problems involved in promoting the practical application of the fast breeder reactor and heavy water reactor.

ii) Consignment Expenses for Small and Medium Light-Water Reactor Development Survey

Special Electrical Power Diversification Account: 63 million yen (new)

Feasibility studies will be conducted on practical application and application systems for small and medium light-water reactors which can flexibly respond to differences in scale and type of demand and regional conditions.

(3) Establishment of a Nuclear Fuel Cycle

i) Chemical Process Uranium Enrichment Technology Subsidy

**Special Electrical Power Diversification Account: 1.359 billion yen
(873 million yen in 1980)**

Amount assigned to MITI 633 million yen (241 million yen in 1980)

Chemical process uranium enrichment has the advantages of low minimum profitability and non-proliferation of nuclear power. It is being developed as a national project under a 6-year plan (total operating expenses 12 billion yen) which began in 1980 in order to supplement the centrifugal separator method now under development. (The Science and Technology Agency is in charge of research and development and MITI is in charge of system development and testing.) In 1981 a detailed design for a model plant will be finished, and construction will begin.

ii) Sea Water Uranium Recovery System Development Study Subsidy

Special Electrical Power Diversification Account: 373 million yen (0 in 1980)

The technology of this system for recovering uranium from sea water will be developed in a 6-year plan (total operating expenses: 4 billion yen) starting in 1981 in order to maintain national security and build bargaining power in relation to countries with resources. In 1981, as a result of development studies (under General Accounts) in a 6-year plan from 1975 to 1980, the stage has been reached where technical reliability promises to be sufficient for conclusive research. Construction will begin on a model plant, especially the laying of water collection pipes in Niomachi in Kagawa prefecture.

iii) Consignment Expenses for Assessment of No. 2 Reprocessing Plant

**Special Electrical Power Diversification Account: 2.191 billion yen
(2.011 billion yen in 1980)**

The construction of the No. 2 Reprocessing Plant by private industry is to be based on domestic technology and it is very important to improve reliability and rate of operation. For this purpose, the confirmation testing of the major equipment and processes necessary for construction of the Second Reprocessing Plant is being carried out in a 6-year plan which began in 1980.

In 1981, continuing on from the initial year period, assessment will be performed on major equipment (for clipping, melting, clarifying, extraction) and processes (measuring instrument systems, criticality design evaluation, etc.).

iv) Development Study Consignment Expenses for Receiving System for Solids Recycled and Returned from Overseas

Special Electrical Power Diversification Account: 399 million yen (new)

Highly radioactive waste from spent fuel used in recycling consigned overseas is scheduled to be returned to Japan after 1970. Therefore, a development study for a waste receiving system (receiving inspection, cask disassembly, a handling system

for repairing damaged canisters) is being carried out under a 3-year plan (total expenses: 1.6 billion yen) beginning in 1981.

(4) Other Items

In addition, General Accounts surveys are being carried out for nuclear power-generation equipment improvement standardization, establishment of technical standards for decommissioning reactors, practical application of advanced reactors for power generation, and interim storage measures for spent nuclear fuel.

1.3 Coal

(1) Coal Mining

Coal Technology Promotion Expenses Subsidy

Coal, Petroleum and Alternative Energy Source Special Account: 401 million yen (388 million yen)

Steep-slope and gentle-slope coal mining, excavation transport, coal mine operation, and coal refining quality control will be mechanized, automated, or put under remote control.

(2) Coal Utilization Technology

i) Coal Utilization Technology Development Expense Subsidy

Coal, Petroleum and Alternative Energy Source Special Account: 3.456 billion yen (2.836 billion yen in 1980)

Coal utilization technology is expected to be developed in the short and middle range and the effects of development will be substantial. Subsidies will be provided to actively promote research and development beginning in 1981 for the research subjects specified by MITI. The specified subjects include fluidized-bed combustion, desmoking technology, coal oil mixture (COM), handling technology, active utilization of powdered coal and lignite, forming of coke, and effective use of coal ash. Each of these subjects is targeted for practical application by 1985. In 1981 a fluidized-bed combustion plant will go into operation, COM will be tested, and a pilot plant for forming coke will be built.

ii) Assessment of Coal-Fired Power Plant Technology

a) Consignment Expenses for Assessment of Coal-Fired Power Plant Ash and Smoke Processing Technology

Special Electrical Power Diversification Account: 2.8 billion yen (3.448 billion yen in 1980)

b) Consignment Expenses for Assessment of Coal-Fired Power Plant Dry Desulfurization Technology

Special Electric Power Diversification Account: 757 million yen (1.25 billion yen in 1980)

c) Consignment Expenses for Assessment of Coal-Fired Power Plant High-Performance Dust-Collection Technology

Special Electric Power Diversification Account: 65 million yen (new)

d) Consignment Expenses for Preparatory Survey of Coal-Fired Power Plant Ash Processing Site

Special Electric Power Diversification Account: 299 million yen (104 million yen in 1980)

e) Consignment Expenses for Assessment of Petroleum-Fired Power Plant Conversion to COM

Special Electric Power Diversification Account: 3.331 billion yen (336 million yen in 1980)

f) Consignment Expenses for Assessment of Petroleum-Fired Power Plant Conversion to Methanol, Etc.

Special Electric Power Diversification Account: 150 million (new)

With respect to a), a test plant is being built at the Takehara Thermal Generator No. 1 (250,000 kW) and a performance test is being conducted. This is being done in the period 1978-1982 at a total cost of 8 billion yen. In 1981 the test plant will be completed and trial operation will be carried out.

The technical development targets are 80 percent effective denitritization and 60 ppm of NO_x emissions.

With respect to b), testing facilities are being installed at the Takeshima Thermal Generator No. 2 (500,000 kW) to test the technology. This project is being carried out in the period 1980-1983 at a total cost of 4.6 billion yen. In 1981 the building of testing equipment will continue. The goals of this technological development are 95 percent effective desulfurization and 50 ppm of SO_x emissions.

With respect to c), all types of dust collection technologies will be evaluated, actual-scale high-performance dust collection equipment will be installed on trial, and a test run will be made. This will be done in the period 1981-1984 at total cost of 1.1 billion yen. The target of this technological development is to reduce the concentration of dust and soot emissions to 0.01 gr/Nm³.

With respect to d), a preparatory site survey will be made for construction of an ash processing center to be used for large-scale, concentrated processing of coal ash. The ash will be made into a reusable material. This will take place in the period 1980-1983 at a total cost of 2.3 billion yen.

With respect to e), the Takehara Thermal Generator No. 2 (350,000 kW) will be converted to a coal-oil mixture system. A combustion assessment will be made to study technical and economic feasibility of such a conversion. This will be done in the period 1980-1984 at a total cost of 21 billion yen.

With respect to f), an assessment will be made of environmental safety necessary for going ahead with conversion of existing petroleum-fired power plants to methanol. Also, a study will be made of the various problems relating to the supply of methanol. This will be done in the period 1981-1985 at a total cost of 12 billion yen. In 1981 a survey will be made of overseas methanol resources and the possible volume of supply. Also, an assessment system will be designed to assess environmental safety of a methanol system.

(3) Coal Liquefaction and Gasification Technology

Share of Development Expenses for Coal Liquefaction Technology (SCR-II)

Coal, Petroleum and Alternative Energy Source Special Account: 15.01 billion yen (7.391 billion yen in 1980)

Consignment Expenses for International Cooperation Project in Coal Liquefaction Technology Development

Coal, Petroleum and Alternative Energy Source Special Account: 91 million yen (75 million yen in 1980)

Based on the U.S.-Japanese agreement for the SCR-II coal liquefaction project, Japan will shoulder 25 percent of the expenses.

The plant will process 6,000 tons of coal per day (equivalent to 20,000 barrels of fuel oil per day). The development period will run from 1980 to 1989 at a total cost of U.S. \$1.439 billion. In 1981 detailed plans will be made and construction will begin. The method of liquefaction will be the SCR-II process, a liquefaction process using a solvent. This system does not require the use of a catalyst.

ii) Coal Liquefaction Technology Research and Development Project Expense Subsidy (FDS Project)

Coal, Petroleum and Alternative Energy Source Special Account: 716 million (407 million yen in 1980)

As part of the scientific and technical cooperation between the United States and Japan, approximately U.S. \$450 million (Japanese share: 8.3 percent) will be invested between 1979 and 1985 to build a large-scale pilot plant which will process 250 tons of coal per day. In 1981 the large-scale pilot plant (completed in March 1980) will go into full-scale operation and be studied. Some equipment (that for liquefaction residue recycling) will be modified. A research proposal for the partial oxidation process will be made and a detailed design prepared.

iii) Consignment Expenses for Coal Gasification Technology Development (Low-Calorie Gas)

Special Electric Power Diversification U.S.: 2.392 billion (1.7 billion)

As part of the Sunshine Plan, technology will be developed for producing a low-calorie gas from coal for clean electrical power generation and, in connection with

this, a combined-cycle power-generation system. This research and development was started in 1974. It will proceed with the late 1980's as a target period for application. In the initial period from 1974 to 1980, experiments were completed with equipment capable of processing 5 tons of coal per day. For the period from 1977 to 1983, tests are being carried out on equipment which processes 40 tons per day. In the period from 1980 to 1986, tests are scheduled which will involve 40 tons per day (100,000 kW level). In 1981 operating tests will be made on the 40-ton-per-day equipment and research will be done on dry cleanup technology and low NOx combustion technology. In addition, a gas-steam combined-cycle power plant with the 1,000-ton-per-day equipment was designed and an environmental study was carried out.

2.1 Accelerated Promotion of the Sunshine Plan

Since its inception in 1974, the Sunshine Plan has progressed to the development stage. Plants are being constructed for all areas of research and development. (Table 1) The domestic and international energy situation is getting worse and there is a great need for substantial progress in development and rapid application of new energy technology.

Faced with this situation, the New Energy Technology Development Committee of the Agency of Industrial Science and Technology, an advisory body to the minister of international trade and industry, made an interim report in November 1979. They made a major issue of obtaining a sufficient supply of energy by 1990. Special emphasis was given to new energy sources which were believed to be susceptible of rapid application, beginning in 1980, and capable of supplying large amounts of energy. Accelerated research and development for new energy sources is being carried out on the basis of the report.

As a result, full-scale plant development will be systematically carried and technology will be actively developed in 1981. In addition, an operating budget of 34 billion will be secured to actively promote international cooperation, making technological development more efficient and spreading out the risks. This will give added impetus to research and development. (Table 2) A summary of the research and development involved is given below by type of energy.

1) Solar Energy

Solar energy has the disadvantages of being low in energy density and subject to the vicissitudes of the weather. However, it has an even overall distribution of occurrence and is inexhaustible and clean. It is thought that a certain portion of this country's energy demand can be sufficiently filled by effective use of this source. However, in order to make the use of solar energy stable and inexpensive, it is necessary to promote research and development for solar energy technology.

In 1981 research and development will continue to be carried out for (1) solar heat power-generation systems, (2) solar light power-generation systems, and (3) industrial solar energy systems. New research themes will also be pursued.

Pilot solar heat power plants were built in Nio-machi, Kagawa Prefecture in 1980 with two types of light collectors, tower and curved surface. Both plants (10,000 kW each) will undergo trial operation.

Table 1 Development Status of Major Plants Under the Sunshine Plan

Solar	1. Solar houses	Hiyakata, Osaka (new, individual) Ayase, Kanagawa (existing, individual) Oita City, Oita (large buildings) Chofu, Tokyo (collective housing)	Since 1977, two types of experimental house for individual residence (new and existing). Since April 1978, experimental housing for application to large buildings. Since January 1979, operational evaluation of experimental housing for application to collective housing. Since June 1978, two types of 1,000 kW solar heat power plants under construction.
	2. Solar heat power plants	Nio-machi, Kagawa	
Geo-thermal	3. Geothermal hot water power plants (binary power plants)	Nigorigawa, Hokkaido (hot water, specialized type) Ogake, Oita (steam, combined type)	In 1978 and 1979, operating evaluation of two types of 1,000 kW binary power plants.
	4. Environment preservation surveys for power plants using large, deep-lying geothermal resources	Toyogoe, Kyushu	Site survey started in December 1978 (scheduled for completion in 1982).
Coal	5. Low-calorie coal gasification plant	Yubari, Hokkaido	Operating evaluation of plant processing 5 tons of coal per day; started in 1975. Construction of plant which processes 40 tons of coal per day started in April 1978 (scheduled for completion in 1981).
	6. High-calorie coal gasification plant	Iwaki, Fukushima	Plant which produces 7,000 m ³ of gas per day (from 20 tons of coal per day) under construction since 1979 (scheduled for completion in 1981).
	7. Plant for coal liquefaction by solvolysis	Nagasaki City, Nagasaki	Operating evaluation of plant which produces 1 ton of coal per day; started in 1977.

Table 1 - continued

Coal	8. Coal liquefaction plant using solvent extraction	Kashima, Ibaragi	Plant which processes 1 ton of coal per day under construction since 1979 (scheduled for completion in 1980).
	9. Coal liquefaction plant using direct hydrogenolysis	Kawasaki, Kanagawa	Plant which processes 2.4 tons of coal per day under construction since 1980 (scheduled for completion in 1981).
Hydrogen	10. Hydrogen manufacturing plant using electrolysis of water	Kawasaki, Kanagawa	Plant producing 4 m ³ of hydrogen per hour completed in March 1980, undergoing operating evaluation.

Table 2 Budget Outline for 1981 Sunshine Plan (unit: one million yen)

Item	1980 budget	1981 budget	Important points of 1981 plan
1. Solar energy	9,544	7,961	(1) Development of solar power plant (1,000 kW, two types) (*6,423 -- *1,123)
Gen. Acct.	1,760	2,322	(2) Development of technology for practical solar light power plant (*1,311 -- *4,300)
Sp. Acct.	7,784	5,639	(3) Expansion of solar light power generation research (977 -- 1,551) (of this, 474 -- 1,312 for amorphous solar cell)
			(4) Development of solar system for industry, etc. (509 -- 507) (of this, *50 -- *216 for industrial solar system)
2. Geothermal energy	8,006	9,223	(1) Comprehensive survey of national geothermal resources (1,946 -- 2,692) (of this, *1,846 -- *2,518 for conducting the survey)
Gen. Acct.	2,002	1,762	(2) Assessment of geothermal energy prospecting (in Sengan and Kurikoma regions) (1,155 -- 1,587) (of this, *539 -- 1,012 for conducting examination)
Sp. Acct.	6,004	7,461	(3) Environmental preservation survey for large-scale deep-lying geothermal resources (Toyogoe region) (*3,004 -- *2,600)
			(4) Development of deep-strata hot water (*262 -- *678)
			(5) Development of power plant using hot water (*357 -- *653)

Table 2 - continued

3. Petroleum energy	8,553	13,514	(1) Liquefaction plant development (liquefaction by solvent extraction (bituminous coal, lignite), solvolysis, and direct hydrogenolysis (*3,060 -- *7,724) (2) High-calorie gas gasification plant (7,000 m ³) development (*2,974 -- *2,518) (3) Low-calorie gas gasification plant development (*1,700 -- *2,392) (4) Expansion of research on liquefaction and gasification (819 -- 880)
Gen. Acct.	819	880	
Sp. Acct.	7,734	12,634	
4. Hydrogen energy	951	948	(1) Development of hydrogen production plant using electrolysis (449 -- *504)
Gen. Acct.	951	444	
Sp. Acct.	0	504	
5. Comprehensive research	551	1,233	(1) Expansion of sea-water temperature difference power generation research (166 -- 213) (2) Expansion of wind-power generation research (127 -- 656) (of this, 0 -- *484 for development of wind-power plant)
Gen. Acct.	551	749	
Sp. Acct.	0	484	
6. International cooperation	679	668	(1) U.S.-Japan joint research on hot rocks (567 -- 565) (2) U.S.-Japan cooperation in coal liquefaction (5 -- 5) (3) IEA cooperation (92 -- 79)
Gen. Acct.	679	668	
7. Miscellaneous	364	112	(1) Agency expenses, research facility maintenance expenses, etc.
Gen. Acct.	360	107	
Sp. Acct.	4	5	
Total	28,648	33,659	Note: Figures marked with an asterisk are allocated from General Accounts and will be carried out through the New Energy Comprehensive Development Organization.
Gen. Acct.	7,122	6,932	
Sp. Acct.	21,526	26,727	

Basic research will be carried out on solar light power generation systems. In addition, an inexpensive refining process for silicon to be used in solar cells and a continuous production line for solar cell panels will be developed. Also, in order to develop an application system for solar light power generation, solar cells will be installed in homes, schools, and factories. Research and development will be carried out for solar cell demonstration systems which test application and concentrated solar power generation systems.

In order to develop solar systems for industrial use, research and development will be done for demonstration systems keyed to factories with multiple thermal processes. In addition, long-term heat storage technology development and materials research will be carried out in order to improve the performance and durability of solar houses (solar systems).

ii) Geothermal Energy

Geothermal energy is one of the few abundant domestic energy sources in Japan. It has great potential as an alternative energy source for many purposes in addition to power generation. With future technological development, its use is expected to expand dramatically.

In 1981 continuing research and development will be carried out in the following areas: (1) surveys to develop large-scale deep-lying geothermal energy, (2) development of deep-strata hot water supply systems, (3) development of power plants using hot water, and (4) international cooperation on hot rock power generation systems.

With respect to surveys for promotion of large-scale deep-lying geothermal development, environmental preservation surveys will continue to be carried out for power plants using large-scale deep-lying geothermal energy in the Toyogoe Regions (Kumamoto Prefecture, Oita Prefecture). Also, continuing from previous years, the following surveys will be carried out.

(a) National geothermal resources comprehensive survey: The purpose of this survey is to ascertain the macro state of existing geothermal resources throughout the country and prepare a basic map of geothermal resources in Japanese territory. A comprehensive survey of topology, geological features, underground heat, and temperature distribution will be made, bringing together the latest survey techniques such as space and aerial survey (remote sensing) techniques.

(b) Confirmation test of geothermal detection techniques: In order to establish a detection system to accurately seek out existing deep-lying geothermal resources, surface surveys and boring surveys will be made of the Sengan region (Akita Prefecture and Iwate Prefecture) and the Kurikoma region (Miyagi Prefecture) and a comprehensive analysis will be made of the survey results.

With respect to development of deep-strata hot water supply systems, test-well surveys will be made to develop demonstration systems in southern Akita City under a 4-year plan from 1980 to 1983. The purpose of the survey will be to promote development of non-volcanic geothermal energy in the vicinity of the city and establish technology for regional heating and hot water supply.

With respect to development of power plants using hot water, research and development will be carried out on technology to increase the scale of binary power plants which generate power by high-pressure vaporization of substances with low boiling points and some problems of recovering low-temperature hot water. In addition, trial operation will be carried out in pilot plants with total-flow power generation using hot water and steam simultaneously.

With respect to hot rock power generation systems, Japan began last year to participate in a hot rock power generation system project being conducted by the U.S. Energy Commission at the Los Alamos, New Mexico Laboratory (under an IEA agreement). This development has the goal of artificially extracting 20,000 to 50,000 kW thermal output of geothermal energy from hot rock.

111) Coal Energy

Coal resources are present in the greatest volume of any fossil energy resources on the earth. With active development and application, we can secure a stable supply of energy and solve environmental problems at the same time by converting solid coal into a liquid or gas, in the process removing polluting substances and converting it to easy-to-use, clean energy.

In 1981, continuing from last year, research and development is being carried out for (1) coal liquefaction technology, (2) high-calorie gasification technology, (3) low-calorie gasification technology for power generation.

With respect to coal liquefaction technological development, the following three liquefaction processes will be promoted for adaptability to various coal types. The overall purpose is developing production of liquid fuel from coal as a substitute for heavy petroleum.

(a) Development of solvent process liquefaction technology: Technical assessment will be made on a liquefaction process using a powerful solvent for coal liquefaction in a plant built in Kashima, Ibaraki Prefecture which processes 1 ton of coal per day. A conceptual plan will also be produced for a pilot plant which processes 250 tons per day.

Also, a liquefaction pilot plant which processes 250 tons per day will be built in Victoria province in Australia for use with lignite. In addition, a survey will be made to test the suitability for liquefaction of Chinese coal.

(b) Development of technology for liquefaction by solvolysis: This process, using asphalt as a solvent, was established for highly fusible coal. Studies will be carried out to reduce the percentage of asphalt used and expand the applicability of this method to non-fusible and slightly fusible types of coal. In addition, research and development will continue to be carried out in a plant in Nagasaki which processes 1 ton of coal per day.

(c) Development of direct hydrogenation liquefaction technology: A plant which processes 2.4 tons of coal per day will be built in Kawasaki, Kanagawa Prefecture and undergo trial operation.

With respect to development of high-calorie gasification technology, construction will be completed on a plant begun in 1979 in Iwaki City in Fukushima Prefecture which produces 7,000 m³ of high-calorie gas per day. It will be used for development of technology to produce high-calorie gas from coal as a substitute for LNG, etc. Other studies will be started on new gasification processes.

With respect to low-calorie gasification technology development, a plant built in Yubari City in Hokkaido, which processes 40 tons of coal per day, will be operated and studied. Also, research will be carried out on high-temperature dry desulfurization and NO_x reduction equipment.

iv) Hydrogen Energy

Hydrogen is produced from water so there is no limit on resources. Since the only product of combustion is water, there is no problem with pollution and it is a clean form of energy. Recently, electricity storage technology has become important because of a tendency toward reduction of load rate and expansion of power plant facilities such as nuclear or new large-scale thermal plants which make load adjustment difficult. Combinations of water electrolysis cells using hydrogen as a medium and fuel cells are expected to be effective for electricity storage and assist in adjustment of the electrical power load during peak and off-peak demand periods.

In 1981 there will be continuing research and development on hydrogen production technology, transport and storage technology, application technology, safety technology, and hydrogen energy systems. In order to develop a practical hydrogen production plant using electrolysis, a pilot plant producing 20 Nm³ of hydrogen per hour will be designed and construction will begin.

v) Comprehensive Research

In order to carry out the Sunshine Plan effectively, appropriate control of research and development must be implemented and the latest developments in technology must be monitored. It is necessary to perform technological surveys and research and development to find and nourish promising seeds of new energy technology.

In 1981 research will be expanded in (1) ocean temperature-difference power generation and (2) wind-power power generation. Also, there will be continuing research in energy storage technology using super-conductive magnets and rotors, measures for development and application of new energy technology, and patent and information surveys. Feasibility of power generation by ocean temperature differences will be studied with a view to constructing a plant with a capacity of 1,000 kW. New electric power generation systems will be developed, component technology will be studied, and surveys of ocean conditions will be made.

In order to build a 100 kW power plant using wind power, the many components involved will be designed, built, and factory tested. Research on component technology and studies of wind conditions will be carried out.

vi) International Cooperation

In 1981 Japan will participate with the IEA in a systems analysis project plus the previous coal technology information and wind power projects. Also, hot rock power-generation systems will be actively promoted on the basis of the U.S.-Japan agreement. A coal liquefaction project will be continued in cooperation with the United States. Also, coal liquefaction and solar energy projects will be actively carried out in cooperation with Australia, and a coal liquefaction will be undertaken in cooperation with China.

2.2 Promotion of Moonlight Plan

The role of technological development is very important in promoting energy conservation. For this purpose, the Moonlight Plan was started in 1978 by the Agency of Industrial Science and Technology to promote development of energy-saving technology.

In 1981 new research and development will be carried out for fuel cell power technology as a large-scale energy-saving technology. In addition, research and development was accelerated and expanded for other large-scale energy technology such as high-efficiency gas turbines and new battery storage systems. 2.956 billion yen was allotted for this purpose from General Accounts (government proposal) and 6.209 billion yen from special accounts for a total of 9.163 billion yen. (Table 1)

i) Waste Heat Technology Systems

60 percent of the total energy in Japan is consumed by mining and industry. Of this amount, 50 percent is expelled as waste heat into the atmosphere, lakes, rivers, or the ocean. Therefore, it is very important in promoting energy conservation to recover and make effective use of the heat emitted by industry.

This research was carried out in a 6-year plan beginning in 1976. Research and development will be done for components used for heat recovery and exchange and heat transfer and storage, in addition to total system research and development utilization of the technology. In 1981 the plan is nearing its final year. Pilot plants will be operated continuously and data will be gathered for production of practical equipment through modification research. Also, model regions will be designated and conceptual designs will be made for total systems. Efforts will be made to widely disseminate the results obtained in research so far.

ii) Magneto Hydrodynamics (MHD) Power Generation

The MHD power generation system uses high-temperature gas which is directed through a strongly magnetized space. The gas emitted from this system will be utilized in steam-powered electric power generation for a combined system with 50 to 60 percent heat efficiency. A 20,000 kWh generator, designed to have the needed output and operating time (sic), was built during the second period plan which started in 1976. It will be used to analyze the durability of the generator channel and the generator system. In 1981 the completed test model (Mark VII) will continue to be operated and tests will be made on the durability of the generator channel and the power generation characteristics of the generator. An additional study

Table 1 Budget Outline for Moonlight Plan in 1981 (unit: one million yen)

Item	1980 budget	1981 budget	Important projects for 1981
Large-scale energy tech- nology	6,929 2,274 4,655	8,136 2,120 6,196	Research and development for large-scale technology which requires a large amount of time and money will be carried out by pooling the intelligence of government, academia, and industry under government leadership.
Technology systems for utilization of geothermal energy	1,203 173 850	887 125 762	Pilot plants using compression and suction type heat pumps will be modified and tested in operation.
Magneto hydrodynamic power generation	1,322 1,322 0	624 624 0	The MHD Mark VII experimental generator will be studied in operation (100 kW, 200 hours) and research will be done on generation characteristics of components, using protective substances.
High-efficiency gas turbine	4,232 728 3,504	5,920 970 4,950	A high-efficiency gas turbine pilot plant will be built (100,000 kW class, heat-efficiency: 50 percent).
New battery power storage system	352 51 301	646 242 404	Component research for the new battery and system analysis using simulation test equipment will be performed, and a study of the total system will be made.
Fuel cell power generation technology	0	239 159 80	In this, the first year, prototype electrodes for the phosphate type cell will be fabricated. Also, component research will be performed for cells using fused carbonate, alkali, and solid electrolyte.
Advanced and basic technology for energy conservation	202	208	In addition to twelve continuing themes, research and development will be carried out for upgrading combustion technology.
International cooperation	35	16	Japan will participate in a project related to the modified heat pump system agreement.

Table 1 - continued

Energy-saving software technology survey	9	14	An energy evaluation system establishment survey and a survey of the amount of energy which can be saved by effective use of resources will be carried out.
Assistance for private development of energy-saving technology	467	467	Assistance will be provided for research and development and assessment of energy-saving technology by private industry. Also, competitive development of refrigerators will be promoted.
Standardization for Energy Conservation	57	56	Studies will be made for energy conservation standards for building materials, home appliances, and industrial furnaces.
Miscellaneous	77 77 0	86 75 11	Clerical and operating expenses for research and development.
Total	7,776 3,121 4,655	9,163 2,956 6,207	

Note 1: The upper figures in parentheses are from General Accounts; the lower figures are from special accounts. Figures without parentheses are from General Accounts only.

Note 2: Alternative Energy Source Practical Development Subsidies granted to private industry for development of energy-saving technology are included in special accounts (420 million yen out of a total budget of 2.4 billion yen in FY 1981 [sic], part of 3.2 billion yen in FY 1981 [sic]).

will be made of element technology research and overseas research and development trends for coal combustion. Research issues of importance to development of a practical generator will be examined.

iii) High-Efficiency Gas Turbine

30 percent of the Japanese energy demand is consumed in the form of electrical power. The efficiency of converting primary energy (petroleum, coal, etc.) into electrical power is a low 40 percent, even for the newest thermal power plants. Therefore, a highly efficient (55 percent) system will be developed which combines a gas turbine with a steam turbine.

A 7-year plan has been underway since 1978. Construction will continue in 1981 on a 100,000 kW pilot plant (overall heat efficiency: 50 percent) to prepare for test operation scheduled for 1983. In addition, materials development and element technology development will be carried out vigorously for the ultimate goal of a prototype plant (overall heat efficiency: 55 percent).

iv) Electricity Storage System Using Advanced Battery

An advanced high-performance, large-capacity battery will be developed to help reduce fluctuation of load in the electric power supply, help save energy in the entire electrical system, and promote substitution of other energy resources for oil. This will be done to achieve practical application of an electric power storage system which stores power in off-peak periods and releases it in peak periods through electronic response.

This research is being done in an 11-year plan which began in 1980. In 1981, component research will be performed with an advanced 1 kW battery using sodium-sulfur, zinc-halogen, and redox flow. Using simulation test equipment, an analysis will be made of the system, including the mode of connection with the electrical system. Also, a study of the total system will be made. This will entail analysis of the load pattern and a determination of optimum storage capacity.

v) Fuel Cell Power Generation Technology (New)

A fuel cell generates electricity by producing an electrochemical reaction between a fuel such as natural gas and hydrogen and atmospheric oxygen. A small-scale decentralized power generation system will be developed, utilizing the advantages of small volume, high efficiency, and low environmental impact of the fuel cell power-generation system.

The purpose of this research will be the practical application of a fuel cell using hydrocarbon fuel (natural gas, coal gas, methanol, etc.) with an output of several tens to several thousands of kilowatts and a generating efficiency of 40 to 50 percent (if use of waste heat is included, an overall heat efficiency of 80 percent). For this purpose, research and development will be done on several types of fuel cell: alkali, phosphoric acid, fused carbonate, and solid electrolyte. Along with this, research on total systems will be performed for optimum utilization of the fuel cell.

vi) Basic and Advanced Energy Conservation Technology

It is difficult for private industry to undertake development of basic and advanced technology which will serve as the seeds of future energy conservation technology or system technology effectively combining various kinds of basic element technology for application to new fields. Therefore, research and development in this area will be carried out in the research laboratories under the jurisdiction of the Agency of Industrial Science and Technology.

In 1981 research and development will continue on such themes as super-conductive electric power transmission and prevention of stalling in engines. New work will start on improving combustion technology (research and development on saving energy in combustion by keeping the proportion of fuel mixed with air to a minimum while maintaining complete combustion).

vii) International Cooperation in Energy Conservation

In order to effectively promote energy conservation research and development, foreign and domestic trends in related technology and the status of research and development must be ascertained continually. Also, it is necessary for the advance countries which consume large amounts of energy to conduct cooperative research. As a part of international cooperation in energy conservation technology research, Japan began participating in the IEA energy cascading project in April 1978 and took part in the modified heat pump system agreement in 1979.

In 1981 Japan is scheduled to participate in the Annex IV heat pump drive unit development based on the modified heat pump system project agreement.

viii) Energy Conservation Software Technology Survey

In order to effectively promote energy conservation, software, including systems technology and operation know-how, must be developed along with hardware. And its development must be carried forward comprehensively.

In 1981 a feasibility study will continue to be made on energy conservation through effective use of resources (development of energy-saving products through study of product life-cycle). Also, a study will be commissioned for establishing an energy evaluation process (ascertaining optimum methods of use by studying the flow of energy consumption, both qualitatively and quantitatively).

ix) Subsidy for Development of Energy Conservation Technology

Assistance for research and development of energy conservation technology by private industry will be provided in the form of an important technology research and development subsidy. This will promote independent private development of energy-saving technology.

In 1981 assistance will continue to be provided for competitive development of an energy-saving refrigerator by private industry. Other assistance will be provided for such things as energy-saving technology for production processes and

energy-consuming equipment. In addition, assistance will continue to be given to promote practical application technology which requires large amounts of money and long-term research.

x) Energy Conservation Standards

New Japan Industrial Standards will be established and revisions will be made to promote energy conservation through standardization. Also, by using the JIS mark, practical information will be provided to consumers for selecting and using products.

In 1981 surveys, such as the survey of standards for energy-saving building materials and equipment and the survey of standards for energy-saving industrial furnaces, will continue to be carried out.

3. Other Energy-Related Measures

i) New Measures

A regional energy development and application model project expenses subsidy (1 billion yen) and a solar energy sea-water desalination project expenses subsidy (336 million yen) will be newly established in the Special Petroleum Account in 1981. Also, the consignment expenses for sea-water pumping technology assessment (90 million yen), the geothermal power plant environmental protection survey consignment expenses (55 million yen), and fuel cell demonstration project consignment expenses (20 million yen) were newly allocated in the Special Electric Power Diversification Account in an effort to expand energy measures.

ii) Continuing Measures

The following allocations were continued or improved over last year: the alternative energy source technology application and development subsidy (from the Special Petroleum Account and the Special Electric Power Diversification Account: 3.2 billion yen (in 1980, 2.4 billion yen from the Special Petroleum Account)), consignment expenses for environmental protection assessment for power plants using large-scale deep-lying geothermal resources (Special Electric Power Diversification Account: 2.6 billion yen (in 1980, 3 billion yen from the Special Electric Power Diversification Account)), and consignment expenses for survey of overall system development for removal of accumulated sand from hydroelectric dams (Special Electric Power Diversification Account: 42 million yen (in 1980, 13 million yen from the Special Electric Power Diversification Account)). (Agency of Industrial Science and Technology, Agency of Natural Resources and Energy)

New Technology

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[Text] 1. Promotion of Big Projects

The large-scale industrial technology research and development system (known as the big projects) brings together the research and development capacities of

industry, academia, and government research laboratories. Using government funding, the system is used to carry out systematic and effective research and development for large-scale industrial technology which is important and urgently needed for the nation's economy but cannot be developed by private industry because of the great cost and time required for research and the large risks involved.

This system was started in 1966. Since then 16 projects (excluding the MHD power-generation and waste-heat-utilization technology systems which were shifted to the Moonlight Plan) have been undertaken. During this time, there have been 1,700 applications for industrial proprietary rights. As a representative policy organ for large-scale technological development in Japan, this system has produced tremendous results.

In 1981 seven research and development projects presently underway will be continued. Also, work will begin on two new themes, a manganese nodule mining system and a high-speed computation system for scientific and technical use. The budget outline for 1981 is shown in Table 1.

(1) Manganese Nodule Mining System

The manganese nodule contains important minerals such as nickel, copper, cobalt, and manganese in abundance and is found in great quantity on the ocean floor at depths of around 5,000 meters. Development of this resource is essential to obtaining a stable future supply of non-ferrous metals for Japan. Research and development will be undertaken to develop a highly efficient and reliable fluid dredge mining system to mine the manganese nodule on a commercial scale. A 7-year program is scheduled for the period 1981-1987.

In 1981 the overall research and development plan will be formulated and work will begin on the basic design of subsystems, such as highly efficient ore-collection systems, and the total system. Supporting studies will also be started, for example, basic experiments on vertical conveyance of slurry.

(2) High-Speed Computation System with Scientific and Technical Applications

High-speed processing of images sent from satellites, simulation of nuclear fusion reactors, and ultra high-speed computations necessary for meteorological analysis cannot be done with present electronic computers. This research and development aims at developing a high-speed computation system which will be able to process such large-scale computations in a realistically significant time frame, at least 1,000 times faster than present electronic computers. A science and technology computation system will be constructed by developing elements like Josephson junctions, gallium-arsenide FET's, and transistors with high electron mobility as well as architecture designed for parallel processing with a large number of distributed basic processors. An 8-year plan for this research is scheduled for the period 1981-1988.

In 1981 the overall research and development plan will be formulated and technological development will begin on devices and various elements of the architecture.

Table 1 Big Project Budget for 1981 (unit: one million yen)

Project	1981 Budget	1980 Budget
Large-Scale Industrial Technology Research and Development Expenses	16,837	16,717
Manganese nodule mining system	50	0
Scientific and technical high-speed computing system	30	0
Method for producing olefins from heavy oil	3,156	2,436
Aeronautic jet engine	1,901	2,063
Resource recycling and utilization system	1,501	2,543
Ultra high-performance laser application combined production system	2,745	2,825
Measurement control system using light	2,419	927
Production of basic chemicals with carbon monoxide	902	49
Offshore petroleum production system	3,515	3,315
Miscellaneous	618	2,560

Note: Miscellaneous includes clerical and coordination expenses and budgets for the pattern information processing system and direct steel production using high-temperature gas reduction, projects which were completed in 1980.

(3) Production of Olefins from Heavy Petroleum

In order to maintain a stable supply of raw materials for the petrochemical industry and make effective use of heavy oil residue, technology will be developed for the economical production of olefins (ethylene, etc.), which have high added value, from heavy petroleum materials such as reduced-pressure residue oil (asphalt) which is in abundant supply. Research has been carried out in a 7-year plan from 1975 to 1981.

1981 is the last year for this research and development project. Decomposition characteristics of the crude oil used, characteristics of the equipment, and coking control conditions are being checked through operating studies and long-term operation of a fluidized-bed pilot plant using coke as a combustion medium (processes 120 tons of petroleum per day). In addition to checking this technology, research is being done on scaling up the pilot plant and decoking tests are being conducted.

(4) Aeronautic Jet Engine

In the second period of this project, which began in 1976, the results of the first period's research (1971-1975) were used and emphasis was placed on operating tests to improve the stability of performance, durability, and reliability of the engine. The goal is to develop a high-performance fan jet engine which can withstand innumerable takeoffs and landings, run economically during flying time, and produce little noise and polluting emissions.

1981 is the last year for this project. Performance and function tests and long-term durability tests will be made with a 5.5 ton tankless engine built for testing. Also, high altitude icing tests will be made at the British national gas turbine laboratory. Other comprehensive tests, including environment adaptability tests, noise tests, and emissions tests, will be made for a final evaluation.

Resource Recycling and Utilization Technology System

This project is devoted to research and development for an urban solid waste processing system designed to recycle and utilize resources. It aims at effective utilization of resources and better processing of urban solid waste. The second period of this project began in 1976. Based on the results of the first period (1973-1975), a pilot plant which can process 100 tons of garbage per day was designed and built, and the system technology is being tested.

In 1981 the methane fermentation plants and plants which produce oil by pyrolysis are being checked. Overall operating tests are being made on each subsystem, for example, pyrolytic gasification, high-speed composting, and pulp refining.

(6) Combined Manufacturing System Using Super High-Performance Laser

This project aims at developing the technology necessary for a quick, flexible combined manufacturing system. This system will be applicable to the manufacture of wide varieties of machine parts in small quantities where the kinds of metal

used as basic materials are consistent. This type of manufacturing makes up 70 percent of machine industry production in Japan. The project is being carried out through a 7-year plan started in 1977.

In 1981, continuing on from 1980, full-scale research was conducted on machining and forming technology for materials, optical parts for use with the laser, and automatic design technology. Also, a test plant, with all of the element technology built in, is being constructed and detailed plans are being made for comprehensive studies of its operation.

(7) Measurement Control System Using Light

This is a research and development project for a measurement control system using light. The system will measure large quantities of data, including images sent from within certain areas such as an industrial park or large plant, electronically and systematically. It can operate even under adverse conditions and makes possible comprehensive observation and control. The research is being done under an 8-year plan which began in 1979.

In 1981 studies will continue on the adaptability of the total system to all types of plants. Detailed designs are being worked out for subsystems according to their functions. Development will also begin on elements of light technology such as light sensors of temperature, pressure, and flow rate and hologram image scanners. In addition, serious research will be done on common elements of light technology.

(8) Production of Basic Chemicals Based on Carbon Monoxide, Etc.

This project involves research and development for new manufacturing processes of basic chemicals such as ethylene glycol and ethanol which are based on synthetic gases obtained from coal and natural gas (a mixture of carbon monoxide and hydrogen). This is a means of using heavier and drier forms of petroleum and is being carried out under an 8-year plan which started in 1980.

In 1981 the search for necessary catalysts to synthesize the basic chemicals desired will begin in earnest. Research and development will also be started for the element technology necessary to develop the separator film needed for gas separation refining (basic studies in producing the separator film from raw materials).

(9) Offshore Petroleum Production System

This is a research and development project for an offshore petroleum production system. The system must be effective in oil fields found where the ocean is more than 300 meters deep and be adaptable to the ocean regions of the continental shelf around Japan. The purpose of the project is to procure a stable supply of oil and natural gas and to improve marine development technology in general. It is being carried out under a 7-year plan which began in 1978.

In 1981 the necessary equipment for comprehensive marine experiments scheduled for 1983 will be designed and built, and part of the equipment will be tested. In tandem with this, detailed plans will be formulated for carrying out the comprehensive marine experiments.

Two other projects, a pattern information processing system and direct steel production using high-temperature gas reduction, will be completed in FY 1980.

2. Promotion of Technologically Advanced Industry

As restraints on resources and energy increase, it is necessary to further promote "informationization," with emphasis on the electronic computer, in order to respond to the expanding and diversifying needs of the people. The computer and information processing industries are not only important as the flag-bearers for the growing use of information, they are strategic industries with a central position in upgrading the industrial structure of Japan.

1) Promotion of Basic Technology Development for Next-Generation Computers

General Accounts: 6.205 billion yen (5.79 billion)

IBM has a 60 percent share of the world computer market. Its next system (FS) uses epoch-making new technology in both hardware and software. Cost-performance is greatly improved and there are new functions and greatly expanded applications. Faced with this situation, it is even more urgent for a next-generation computer to be developed in Japan.

The VLSI is the technological nucleus for next-generation hardware. With the help of a subsidy, it has been satisfactorily developed under a 4-year plan. But in the next-generation computer system, epoch-making new functions, not available previously, will be demanded in software and peripheral and terminal equipment. For this purpose, it is necessary to promote advanced technological development of control programs, ultra-high-level language processing, Japanese language input and output devices, ultra-large-capacity memory devices, etc. Therefore, basic software (operating systems) and peripheral and terminal devices with dramatic technological innovations will be developed by a research association (the Electronic Computer Basic Technology Research Association) under a 5-year plan which began in 1977.

The projects planned for this year are as follows.

a. Basic software technology development:

Development of control programs including basic technology, network control technology, data base control technology, and batch-all machine technology; development of ultra-high-level language processing technology, the main items being ultra-high-level language programs and Japanese language processing system technology.

b. New peripheral and terminal equipment technology:

Development of Japanese language information processing devices such as kana-kanji conversion devices, Japanese voice input devices, optical character recognition devices for Japanese characters, and a Japanese language printer; memory devices such as a large capacity magnetic disk and large capacity magnetic bubble domain memory.

11) Surveys and Research on Electronic Computer Basic Technology Development

General Accounts: 15 million yen (0 in 1980)

Presentday computers are in the fourth generation in which VLSI's are used as components. In the 1990's a new type of computer (non-Neumann type) will emerge and be fundamentally different from today's computer in both theory and structure. Research and development on new types of computers has already begun in many foreign countries. Japan also must develop advanced technology that will lead the world. For this purpose, basic studies will be made on technological development issues, research and development schedules, and research and development systems and organizations to produce a new type of computer.

iii) Administration of the Information-Processing Development Association

General Accounts: 2.658 billion yen (2.781 billion yen in 1980)

a. Promotion of Software Manufacturing Technology Development Program

In order to modernize and rationalize the software production process, the goal is to switch software production from the conventional manual work process to automatic production processes using computers and raise the level of the Japanese software industry's technological development capacity and production system until it is comparable with that of the United States. This program began in 1976 and is being promoted as a long-term plan. 1981 is the last year of the program and the project will be completed.

b. Promotion of Software Maintenance Technology Development

Software, of its nature, requires maintenance to make changes in the processing environment, e.g., in the operating system, and to respond to the user's needs. Maintenance costs make up 70 percent of all software costs. Maintenance work is mostly done manually and this is a major cause of low productivity and reliability and rising software costs. To overcome this situation, a 5-year plan will go into effect in 1981 to rationalize and automate maintenance operations and develop total systems to improve productivity and reliability.

c. Promotion of Advanced Information Processing Technology Development

Development of advanced information processing technology combining software and other technology is absolutely essential to promote effective utilization of information in Japan. The best technicians and engineers will be sought from a variety of organizations such as information-processing industries, computer manufacturers, users, and universities to form a project team. They will do research and development at the Technology Center set up in the Information Processing Development Association.

d. Expansion of Special Program Development

In order to upgrade computer utilization and promote distribution of programs, development of programs which are advanced, of general use, and difficult for private industry to develop alone will be commissioned and their dissemination will be promoted. In 1981 development will be commissioned for packaged programs and advanced data base service programs.

iv) Development of Health Care and Network Systems

General Accounts: 222 million yen (222 million yen)

There are many problems in the field of medicine in Japan such as inadequate emergency medical service. In order to solve these problems, development of a medical information system utilizing computer technology and medical equipment technology could be effective. For this purpose, a 5-year plan began in 1978 to join medical facilities such as hospitals, clinics, and diagnosis and testing centers for joint use of high level medical information, unified use of health control data, and joint use of high-level medical resources to upgrade and rationalize medical care throughout regions. In 1981 development of basic networks will continue. A new application will be development of a clinical drug information system.

(2) Promotion of Aircraft Industry

The Japanese aircraft industry is behind the United States and it has depended on defense-related demand. Therefore, it is urgent that research and development be promoted for the private aircraft sector.

(i) Promotion of Next Commercial Transport Plane (YX)

General Accounts: 2.043 billion yen (6.943 billion yen in 1980)

The YX plan began in 1978 to develop a 200-seat wide-body 767 (twin-engine) and 777 (3-engine) in cooperation with the United States and Italy in order to respond to market trends of the 1980's. Japan is concentrating on development of the fuselage with a 50 percent subsidy provided to the Private Transport Plane Development Association (a foundation). In 1981 work will continue on construction of a prototype 767 and a durability test plane. After the final assembly is completed by the Boeing Company, test flights will begin in September 1981 and model certification is scheduled for the summer of 1982.

(ii) Promotion of Development of Commercial Transport Aircraft to Follow the YX (YXX)

General Accounts: 353 million yen (0 in 1980)

For greater progress of the Japanese aircraft industry, the YXX private transport plane will be developed after the YX. A proposal has already been submitted in the Aircraft Machine Industry Council for international cooperation in development of a 130-seat-or-larger private transport plane in the late 1980's in anticipation of future market trends. Also, a U.S. aircraft manufacturer made a proposal to Japan last year for cooperative development of this class of private transport plane. As the initial stage of cooperative development, a proposal was made for a cooperative survey with exchange of information on a non-committal basis. In 1981, as a preliminary stage of joint development, it will be necessary to firm up Japanese thinking about the craft to be development. For this purpose, preliminary designs will be made and checked.

(iii) Promotion of Jet Engine (XJB) Development for Private Aircraft

General Accounts: 4.722 billion yen (1.787 billion yen in 1980)

A high-bypass jet engine with 90 tons of thrust, low noise and pollutant emissions, and good fuel economy will be designed for a 130-seat or slightly larger aircraft

for which a large demand is expected. It is being developed under an 8-year plan which began in 1980 with equal cooperation between three Japanese engine manufacturers and the Rolls Royce company of Great Britain.

The preliminary design and tests of components were begun in 1980. In 1981 an experimental engine will be fully designed and jigs and tools will be made for testing equipment and the experimental engine. Also, production of the experimental engine will begin. Total development expenses will be 1.4 billion, half of which will be borne by the Japanese side. After the test-flight engine and model certification engine are designed and built, model certification for the engine will be obtained in early 1985. Completion of this development is scheduled for late 1987.

(3) Promotion of the Space Industry

Earth Resources Satellite Research and Development

General Accounts: 53 million yen (56 million yen)

Special Petroleum Account: 1.017 billion yen (0 in 1980)

The U.S. LANDSAT satellite has demonstrated that a satellite can be an effective means of gathering information about the existence of resources. Many other countries are carrying out plans to launch resources satellites to obtain data which would be useful in cooperative prospecting and development of resources in countries possessing them. In order to carry out a resource strategy toward the outside world, Japan must obtain independent data on overseas resources and cooperate actively in developing them. Therefore, research and development will be conducted for preliminary design of an earth resources satellite and the instruments it will carry, as well as data processing, analysis, and utilization technology.

The following projects are scheduled for 1981: (1) total system studies, (2) preliminary design based on conceptual design, (3) research and development for satellite instruments; trial production of parts of synthetic aperture radar, building of breadboard models, (4) research and development of data processing technology to correct data obtained from the synthetic aperture radar and convert it to a normal image, (5) research and development for data analysis technology to utilize the data obtained in prospecting for resources. The total development expenses through 1986 are estimated at 8.2 billion yen.

(4) Promotion of Nuclear Power Equipment Development

Assistance for Nuclear Power Development Support Systems

Special Electrical Power Account: 1.105 billion yen (852 million yen in 1980)

In order to make operating control and equipment control easier in nuclear power plants, support systems will be developed to (1) detect irregularities that could lead to trouble early and (2) help operators make appropriate responses when irregularities occur. In 1981 development work will be done on (1) an instruction system that comprehensively monitors the operation of all equipment making up the nuclear power plant by computer and gives appropriate instructions and (2) an

automatic inspection system used inside the housing which detects data on all equipment exposed to radiation inside the housing with detection instruments which move on rails or on the floor.

(Agency of Industrial Science and Technology, Machinery and Information Industries Bureau)

International Cooperation

Tokyo KOGYO GIJUTSU in Japanese Vol 22, No 3 Mar 81 p 45

[Text] 1. U.S.-Japan Scientific and Technical Cooperation

Based on the U.S.-Japan Energy Research and Development Cooperation Agreement concluded in May 1979, the United States and Japan are cooperating in such areas as nuclear fusion, coal liquefaction, geothermal energy, light synthesis, and high-energy physics.

MITI is continuing to promote U.S.-Japanese cooperation on a coal liquefaction joint project (construction and operation of an SRC-II demonstration plant which processes 6,000 tons per day and a large EDS pilot plant which produces 250 tons per day) and a geothermal joint project (construction and operation of a 20 to 50 MWt heat extraction plant using a hot rock power generation system).

2. Promotion of Research and Development Cooperation with Developing Countries

General Accounts: 171 million yen (169 million yen in 1980)

The International Industrial Technology Research Project has been under way since 1973 promoting the transfer of technological development capacity, chiefly in research cooperation with developing countries. The following activities will be carried out in 1981.

i. Special Research

Six new projects will be added to continuing projects. These joint projects are carried out in local research facilities and facilities of the Agency for Industrial Science and Technology, with the participation of local researchers, to do the research needed by developing countries.

ii) Transfer of Research

Existing Japanese research will be modified locally to fit the conditions of the developing countries. 4 such projects will be undertaken.

iii) Research and Development

One project will be carried out to analyze resources of developing countries systematically and comprehensively, search out the possibilities of use from many different angles, and discover the seeds of future special research and transfer research.

iv) Overseas Technological Survey

A survey team will be sent overseas to search out research cooperation projects and the status of overseas technology.

v) Researcher Exchange Activities

Japan will contribute to the improvement of developing countries by inviting the research administrators from developing countries and explaining the conditions of research and development and the administration of research laboratories in Japan.

Also, students will be accepted from developing countries and trained in technical subjects.

vi) International Symposium

An international symposium on common problems of technological development in the developing countries will be held with panel members invited from the developing countries.

(Agency of Industrial Science and Technology)

Foundation for Research, Development

Tokyo KOGYO GIJUTSU in Japanese Vol 22, No 3 Mar 81 pp 45-47

[Text] 1. Operating Expenses Related to the Agency for Industrial Science and Technology

(1) Assistance for Major Technology Research and Development

A major technology research and development subsidy (from General Accounts) of 2.61 billion yen will be allocated for research and development of new and innovative technology. This will be applied to technology which is expected to be economically important in the Japanese industrial structure which will be more and more characterized by knowledge-intensity, resource conservation, energy conservation, environmental preservation, and systematization of housing. It will be aimed at technology which will become central next-generation production technology.

(2) Research by Testing and Research Laboratories

Research necessary to the progress of mining and industrial technology, research on setting and maintaining standards, and research necessary to enforcing the laws (ordinary research) will be conducted in 16 testing and research laboratories. This research will be focused on development of technology necessary for administration of trade and industry and purposive basic research which must be carried out on a particularly large scale or needs to be concluded quickly (Special Research, Table 1) and research which must be carried out by the national testing and research organs as a matter of course.

Table 1 Special Research in Testing Centers and Research Laboratories

General Accounts (unit: million yen)

Research Category	Number of Projects in 1981	1981 Budget	1980 Budget
Industrial standardization	16	95	61
Standards and inspection technology	12	293	298
Safety and security technology	5	183	196
Earthquake prediction technology	3	168	162
Resource development and utilization technology	11	170	159
Marine development technology	9	239	243
Housing-related technology	3	49	54
Consumption science technology	5	74	73
Microorganism application technology	5	87	51
Comprehensive research in bionics	12	228	313
New materials technology	13	197	195
Macromolecular engineering technology	5	61	78
Catalyst technology	0	0	50
Industrial foundation technology	11	163	120
Systems engineering application technology	5	71	86
Electronics technology	10	582	625
Space development technology	3	87	87
Subtotal	128	2,744	2,862
Editing of research		177	191
Subtotal	128	2,921	3,053
Assignment of comprehensive research in bionics	4	9	9
Subtotal	132	2,930	3,062
Pollution prevention technology	56	1,833	1,877
Technology for peaceful use of nuclear power	8	769	702
Technology for assistance to small enterprises	6	63	87
Subtotal	70	2,665	2,666
Total	198	5,595	5,728

2. Improvement of Industrial Proprietary Rights Administration

(1) Promotion of Mechanization of Application Processing, Etc.

General Accounts: 1,897 million yen (1,835 million yen in 1980)

In order to deal with the increase of applications for patents and other industrial proprietary rights and the accumulation of unprocessed applications, the mechanization of review and clerical processing will be comprehensively promoted to provide quick and precise granting of rights.

In 1981 the mechanization of clerical work connected with applications will be pushed forward with emphasis on development of programs for revision of design classification and a system for processing clerical work connected with judgments. In addition, mechanical reference for trademarks and examination processing will continue to be promoted.

(2) Rationalization of Applications, Etc.

General Accounts: 13 million yen (12 million yen in 1980)

To cope with the increase in applications at the Patent Office, it is necessary to develop a way to grant rights for useful inventions quickly and accurately. Measures were implemented to rationalize applications, etc. made from 1976 on. In 1981 these measures will be strengthened even more by thorough detailed guidance which will also be given to industries in regional industrial cities.

(3) Promotion of Internationalization

General Accounts: 339 million yen (381 million yen in 1980)

More and more progress is being made in internationalization of the proprietary rights system. This includes such things as the conclusion of patent cooperation agreements, the issuance of the Budapest agreement on international approval of depository of microorganisms for Patent procedures, and the acceptance of students from the ASEAN countries and increased requests for sending of specialists. In order to deal with the situation, the Patent Office will continue undertaking vigorous promotion of internationalization in the future to fulfill the international obligations of Japan as a major patent country. In 1981, in addition to strengthening previous measures, a conference for unification of operating standards for patent cooperation agreement procedures will be held in Tokyo in May of this year.

(4) Publication of Patent Gazette

General Accounts: 5,757 million yen (5,164 million yen in 1980)

The official gazette will continue to be published efficiently to facilitate quick and accurate examination, clerical processing, and announcement of industrial proprietary rights to the private sector.

3. Enforcement of Industrial Standardization Law

General Accounts: 710 million yen (696 million yen in 1980)

The Industrial Standardization Law provides for the establishment and dissemination of appropriate and rational industrial standards. By promoting industrial standardization, the law aims at improving the quality of mining and industrial products, increasing production efficiency, and other forms of production rationalization. It also aims at simplification and greater fairness in business transactions and rationalization of use or consumption. In sum, the purpose of the law is to promote the public welfare.

There are approximately 10,000 standards established so far, 1,100 products with the JIS mark, and approximately 15,000 factories approved for display of the mark.

Outline of Activities

(1) Establishment and Revision of Japan Industrial Standards and Implementation of the JIS Mark Display System

In setting the Japan Industrial Standards, an attempt is being made to conform with international standards in conjunction with the establishment of the GATT standard code. Also, the proper use of the JIS mark is being facilitated by introduction of an examination system using public notification so the mark will be trusted even more by consumers. The JIS mark display system has also been liberalized for foreign enterprises and is handled in the same way as for domestic enterprises.

(2) Promotion of International Standardization Activities

Japan is a member of the International Standardization Organization (ISO) and the International Electrical Standards Conference and will carry out its duties as a recting country. A computer system for participation in the ISO information work will be developed and research and development will be conducted for standard substances which will be the basis of an international approval system for testing and inspection organs.

(Agency of Industrial Science and Technology, Patent Office)

9651

CSO: 4105/150

SCIENCE AND TECHNOLOGY

BRIEFS

300-TON SLIDE SHIP--The MSDF is considering a 300-ton slide-type ship with a diesel engine as a candidate for the PM-X new missile-armed patrol boat to replace the 100-ton PT torpedo boat. It intends to arm the PM-X candidate with the Harpoon surface-to-surface missile and a 76mm gun system. The MSDF is studying not only the slide type but also the hydro-foil type, the SWATH (small waterplane area twinhull) type and another semisubmersible type as candidates for the PM-X in a bid to get a test PM-X vessel funded in FY 1982. Type selection will be based on an extensive study covering everything from operations to costs. Replacement of the existing five PTs with the PM-X's is expected to start under the FY 1983-87 MTDP (medium-term defense program) to be drafted in the current fiscal year. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English No 526, 17 Jun 81 p 7]

R&D PROGRAM COORDINATION--The Defense Agency's TR&DI is expected to coordinate schedules for research and development of the GSDF's weapon systems for the period between FY 1982 and 1987 to fix an efficient priority order in consideration of massive funds needed especially for combat vehicle development. Development items for the period include a new main battle tank, a mechanized infantry combat vehicle (MICV), an AW-X self-propelled antiaircraft machine gun system, a modified 155mm self-propelled howitzer, a scout/warning armored vehicle, an automatic rifle and a 155mm shell. Test fabrication costs regarding such combat vehicles as the MBT, MICV, AW-X and HSP are expected to increase sharply with fire-control systems and other electronic systems modernized. The TR&DI expects to develop the modified 155mm HSP by FY 1985, the AW-X and scout-warning vehicle by FY 1987, and the new MBT and MICV by FY 1988. These items may be given priority. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English No 526, 17 Jun 81 p 10]

AEROSPATIALE TOP EXECUTIVE--Michel Thomas, Senior Vice President for International Affairs of Aerospatiale is due to arrive in Tokyo, June 18 for meeting with industry leaders as well as sales representatives to explain present and future programs of the company and to introduce the new representative in Tokyo, Yves Favennec. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English No 525, 10 Jun 81 p 3]

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